



FS982X

Integrated Development Environment

User's Manual

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Taipei Office :

28F, No.27, Sec. 2, Zhongzheng E. Rd.,
Danshui Town, Taipei County 251, Taiwan

Tel. : 886-2-28094742

Fax : 886-2-28094874

<http://www.fsc.com.tw>

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1. Introduction of FS982X IDE

General Description

FS982X IDE, developed by Fortune Semiconductor Corp. (FSC), is a brand new simulation and programming developing tool for FSC's MSP, whose structure is simple and easier to use, can simulate and program OTP products at the same time. USB protocol is adopted, with fast data transmission, easier to be connected to computer, great convenience for users.

RISC instructions are used in code, more easier for users, it is very important to the application of MCU.

FS982X series products is a one-time programmable MSP, the MSP provides calculation, one-time programmable program register, high accuracy multichannel, fully difference ADC, low noise OPAMP, LCD display driver, highly regulated bandgap, voltage promotion and regulated voltage power, buzzer driver circuit, clock oscillation circuit, which are integrated all together. The application field is very broad. Owing to the built-in one time programmable register of the series products, the developing cycle is shortened, and the new products enter into market very fast, the products are very popular.

For the convenience of introducing the product, FS9822 is taken to be the example in this user's manual, other type of chips are similar.

English and Chinese are available in window's language; this user's manual introduces the product in English.

This user's manual can be applied to all the products of FS982X series.

1.1 FS982X IDE

In order to support FSC's whole series MSP (Mixed Signal Processor) product's application and development, FSC provides complete developing tools to make customers more convenient during product's development and use. The whole set of developing tools includes:

- **Software : FASM500**
- **Hardware : FS Control Board 、FS982X Emulation Board**, as shown in the Figure1.1.

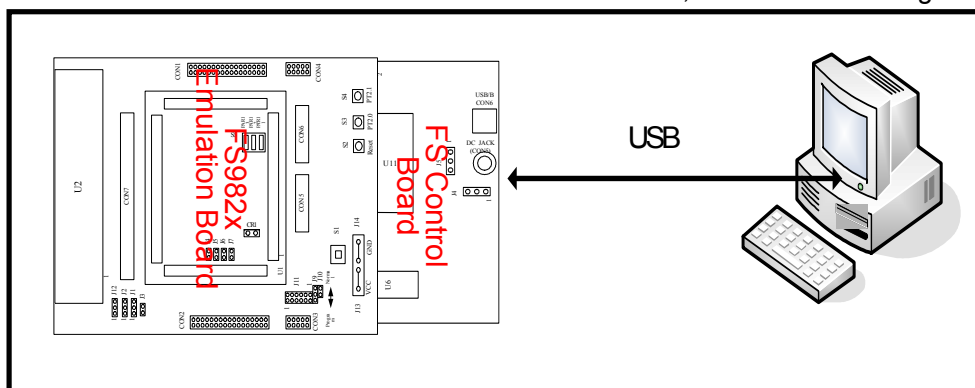


Figure 1.1 Overview of FS Control Board and FS982X Emulation Board

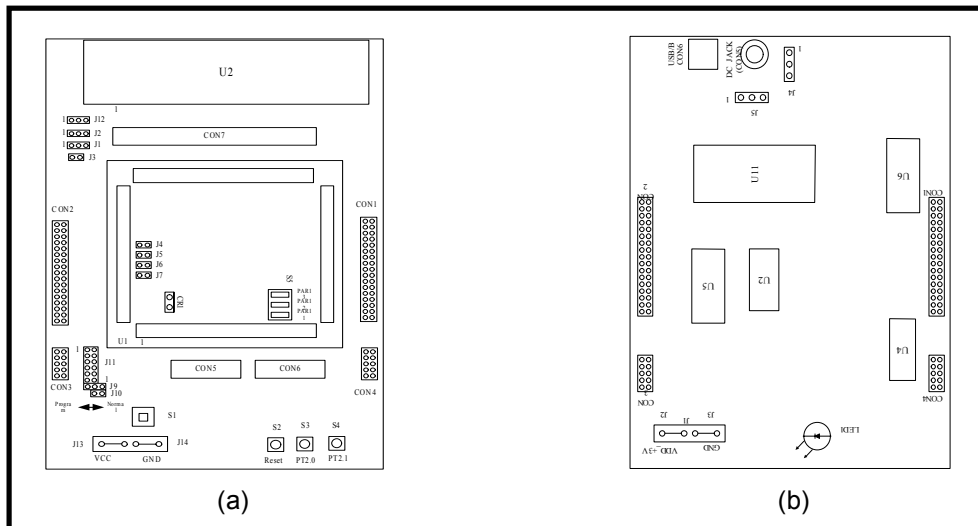
FS982X IDE is applied to FS9912 、FS9922 、FS9932 、FS9821 、FS9822 、FS9823 、FS9824 、FS6811 、FS3861 、FS3866 and FS9855 etc. products' online emulation and application verification, as well as programming of OTP products.

Software provides friendly windows for user's coding without difficulties; various emulation functions are provided by hardware during debugging, such as multifunction tracking, single step execution and breakpoint, etc. FS982X IDE can transmit info., and the power is supplied by USB

In order to enable FS982X IDE applied to all of FSC's MCU products, the developing system hardware is divided into:

- FS982X Emulation Board for emulation of chip and system application/verification, shown in the Figure 1.2.
- FS Control Board for control/debug, as shown in the Figure 1.2.

FS982X IDE Control Board uses USB protocol, several FS982X IDE can be emulated by one set PC, no extra power source is needed during emulation, USB built-in power or extensional DC 5V power can be selected during programming.



1.2 Coding Procedure of FS982X IDE

FS982X IDE coding and compiling provide friendly windows, complete coding procedure as shown in the Figure 1.3. “Setup of Compiling” is used during relevant setting of compiling, such as Chip Selection, selection of RAM, compiling by many files one time. “Set of Linking” provides selection of setting of emulation/programming, such as IC emulation, OTP programming.

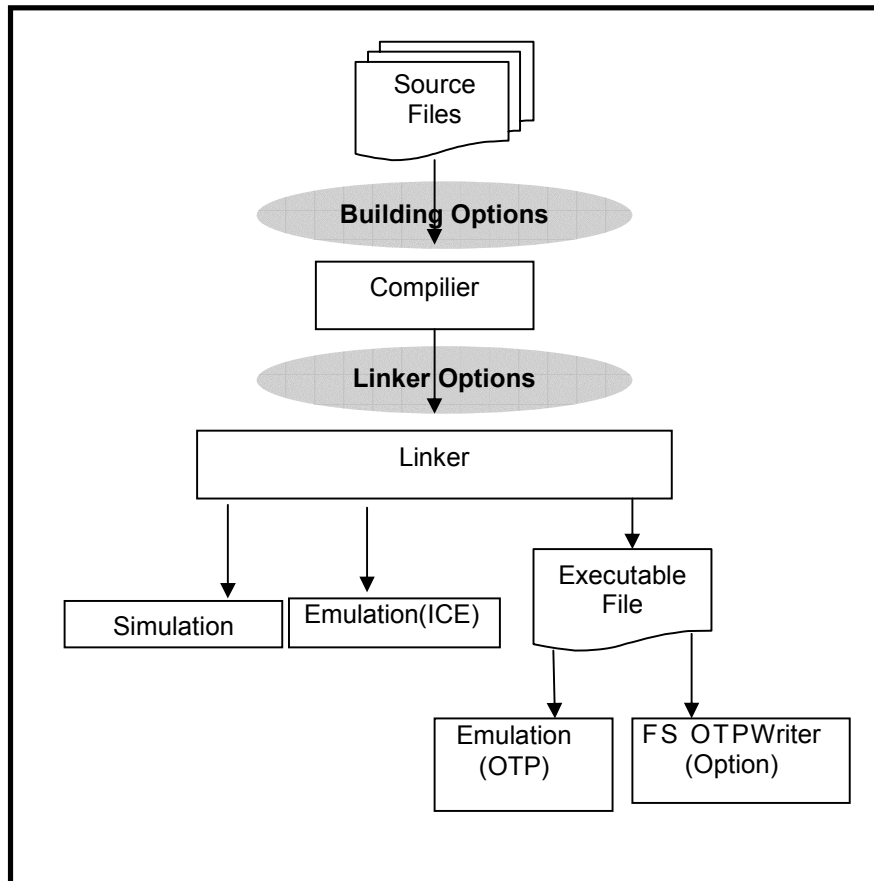


Figure 1.3 FASM500 Project Manager

1.3 Features of FS982X IDE

FS982X IDE is a high efficiency, low cost developing tool, whose functions are as follows:

(1) Software simulation

- Code instruction simulation
- Code logic simulation
- Provides perfect software breakpoint system (10 points)

(2) Hardware emulation

- Easier for use and installation
- Internal or extensional oscillator can be used
- Provides perfect hardware breakpoint system (3 points)
- Supports immediate tracking function and detecting trigger function.
- Provides USB protocol
- Shows results (LCD)
- Provides OTP programming

(3) Software development screen

- Provides assembly compiler
- Compiler for windows structure
- Supports multiprogramming debug platform
- Provides programming executable file
- Provides perfect Debug Window, Watch Window, Ram Window, Register Window, and Stack Window.

2. Basic Training of FS982X IDE

2.1 General Description

This chapter makes initial users learn how to use FS982X IDE, can be acquaint with “creating a new file”, “edit a file”, “code debug”, “OTP programming”, etc. The contents are consisted of 3 parts: software installation, hardware installation and basic training.

The main readers of this chapter are initial users. For the users who have been familiar with FSC’s MSP products, may skip this chapter.

2.2 Software Installation

2.2.1 Install/Uninstall

“FASM500” is applied to the development of FSC whole series ICE & OTP, but it is only available in Windows Working System.

(1) Install

When use CD-ROM to install, please execute “setup.exe”, screen is shown in the Figure 2.1, then follow the hint in the screen to install. If it fails, please search “setup.exe” program in the disc and install.

When the program is down-load from network, please unzip the file and execute the resulting file to install.

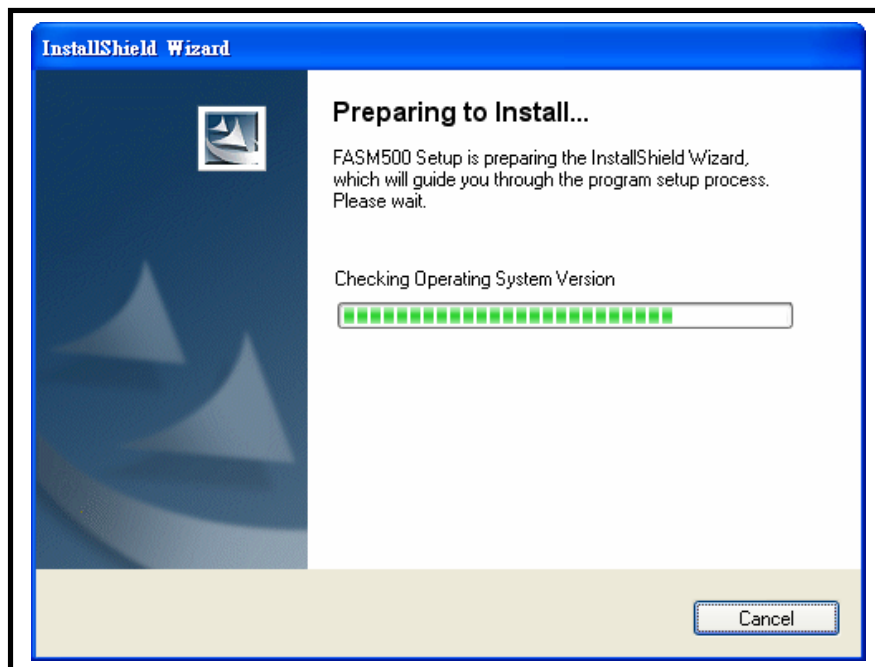


Figure 2.1 Installation window

Please be aware that in order to avoid any mistakes, please process the installation works as an administrator during installation of FASM500.

(2) Uninstall

- Step 1: Select 『Start->Setup->Control Panel』
- Step 2: Use mouse clicking “Add or Delete Program”, search “FASM500” in the Table and click.
- Step 3: Click “Delete” can delete the program.

2.2.2 Execution of FASM500

After installation, it executes in 『Start->Program-> FASM500 』, the screen shows as Figure 2.2, it means the program is installed.

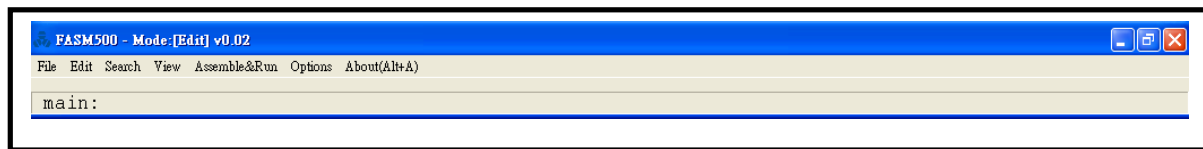


Figure 2.2 FASM500 Window

If it is not set in the access route C:\Program File during installation, please execute under user selected installation menu to confirm that the installation is complete.

2.3 Hardware Setup

2.3.1 General Description of FS982X ICE & FS982X OTP

There are two kinds of chip: ICE and OTP in FSC FS982X series chips.

- ICE (In Circuit Emulator): For hardware emulation, not providing ROM, has to use the RAM in FS Control Board.
- OTP: Practically used product, provides ROM, only needs power, not necessary to use FS Control Board, can independently work.
- FS982X ICE and FS982X OTP can be developed and used with FS982X IDE, during which the corresponding Transfer Board shall be used, as shown in the Figure 2.3. For the Transfer Board circuitry, please refer to the enclosed Diagram 1, 2.

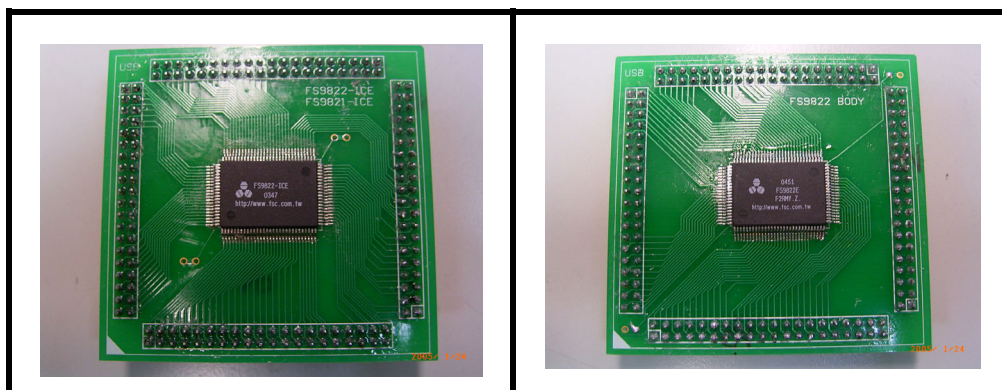


Figure 2.3 Transfer Board of ICE and OTP

2.3.2 Overview of FS982X Emulation Board

FS Emulation Board is provided for verification of ICE and OTP chips, as shown in the Figure 2.4, the board is applied to FS982X series MCU, provides:

- LCD (Liquid-crystal display)
- LCD control selection end
- Power Switch
- Button
- Working and Programming (Normal / Program) Selection End
- FS982X chip switch

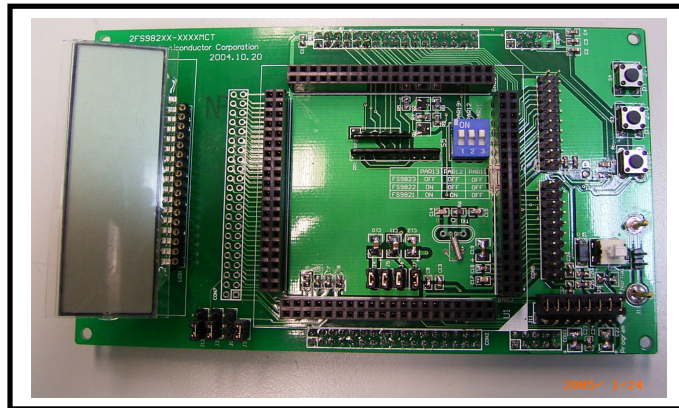


Figure 2.4 FS982X Emulation Board

Note: For the detailed description of FS982X Emulation Board, please refer to Chapter 7.

2.3.3 Introduction of FS Control Board

FS Control Board is applied to FSC whole series MCU, providing USB protocol convenient to communicate with PC, and debugging tool, as shown in the Figure 2.5.

The Board provides:

- USB protocol
- Independent RAM
- Independent power system

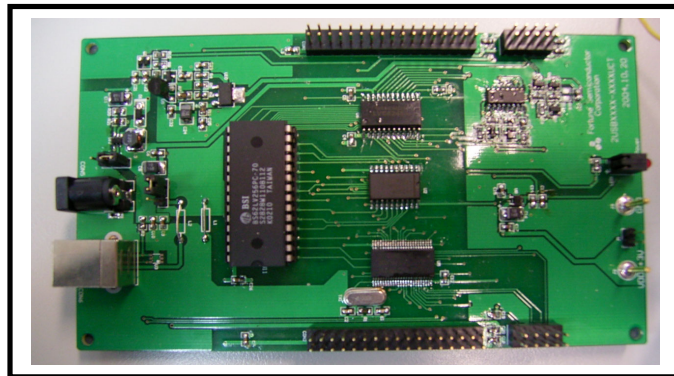


Figure 2.5 FS Control Board

Note: For the detailed description of FS Control Board, please refer to Chapter 8.

2.3.4 Connection of Hardware System

Hardware system connection can be divided into 3 steps:

(1) Setup of Switch and Jumper of FS982X Emulation Board

- Adjusting switch (S5), setup is shown in the Table 2.1.
- Adjusting J11 jumper, programming shall be switched to “Program”, working to “Normal”.

Note: Unpredictable error will occur if switch and jumper are incorrectly adjusted during use.

Table 2.1 Selection of Switch (S5)

	PAR13	PAR12	PAR11
FS9823-ICE	OFF	OFF	OFF
FS9822-ICE	ON	OFF	OFF
FS9821-ICE	ON	ON	OFF

(2) Connection of Board: Connect the FS Control Board, FS982X Emulation Board and Transfer Board by pin to pin, as shown the Figure 2.6.

(3) USB Connection: Use USB wire to connect the FS Control Board and PC.

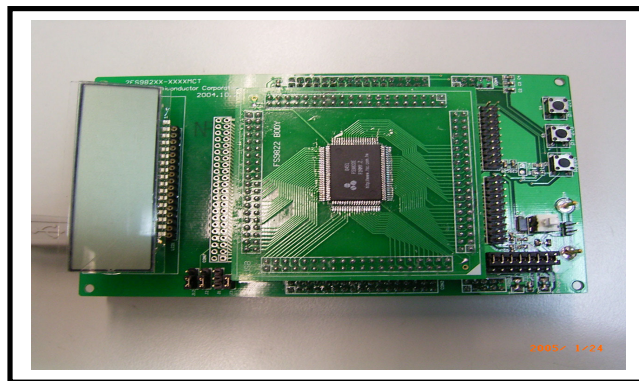


Figure 2.6 Complete Hardware Systems

The consumption power is about 90~150mA during OTP programming, therefore, please do not parallel connect USB with bulk current when USB internal power is used. For example: USB extensional connect type disc without extensional connect power. When FS Control Board communicates with PC screen by USB, if there is no response in 2 sec., the communication fails; therefore, please do not use other USB device to proceed bulk info. transmission, like, USB hard disc save.

2.3.5 Comprehension Test

The comprehension test mainly to verify the I/O, LCD, key, counter Interrupt, analog temperature, 『Start->Program->FASM500』 will be executed at first, then it will proceed as following steps:

(1) Setup:

Select 『Options -> Set up』 from the tool bar, as shown in the Figure 2.7.

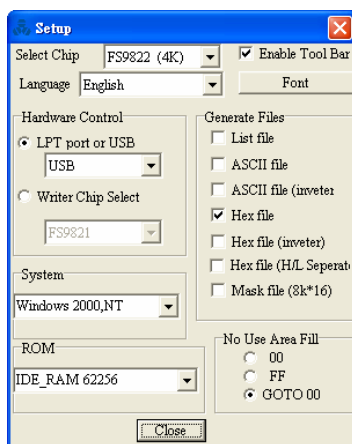


Figure 2.7 “Setting” window

This example focuses on FS9822 chip, some hints need user's attention:

- U1 select FS9822 ICE chip ◦
- Please select 'ON' position in PAR13 of S5, but select 'OFF' position in PAR11、PAR12 (refer to the Table 2.1) ◦
- 1.Short 2-3pin of J2, short 1-2 pin of J2, open J1 and short J3 ◦
- Other products of FS982x may be referred to this example.

(2) Open File and Compiler:

Select 『File->Open File』 from the tool bar to open the file “C:\Program Files\FS982X IDE\FS982X\Hardware Demo\Test.asm”, and select 『Assemble&Run->Debug Mode Set up->Hardware Emulation ID Number:0』, then choose 『Assemble&Run->Run』 to proceed compiling works. After compiling, the screen is as shown in the Figure 2.8.

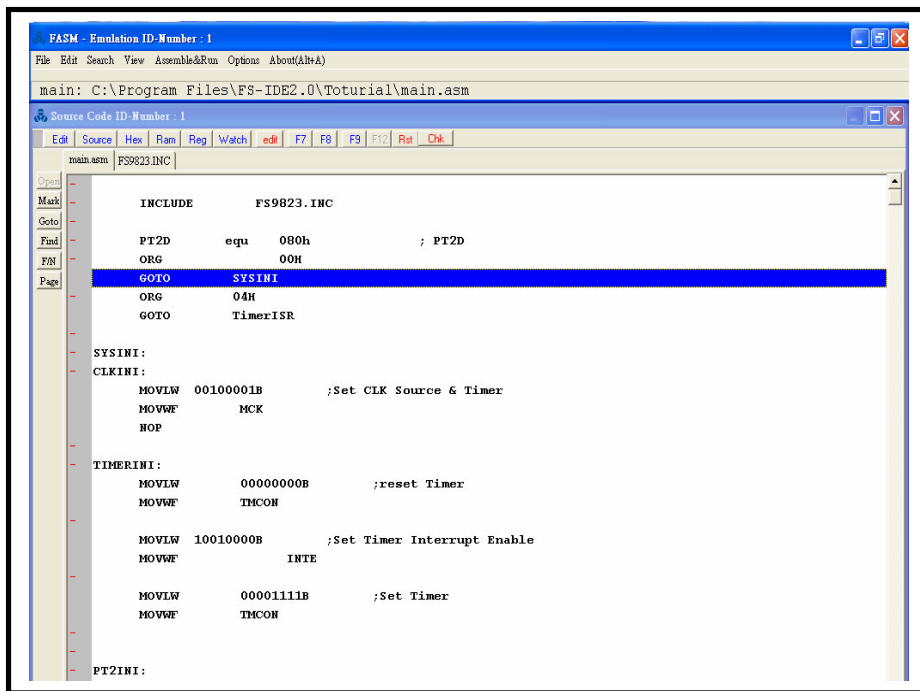


Figure 2.8 Compiling Window of Test.asm

(3) Test and Execution:

Test steps are as follows:

Step 1: Select 『Assemble&Run ->Run』 from the tool bar or press the hot key F9 to build code and execute, then LCD is shown as the Figure 2.9, to proceed back counting 10 sec. Value drifting is normal if test panel is not added in the system.

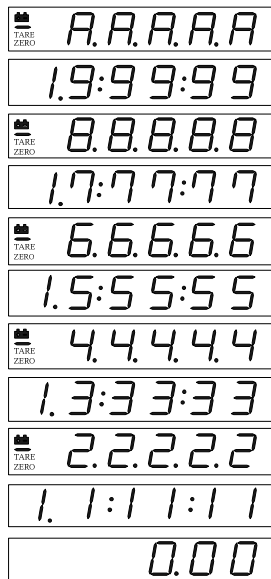


Figure 2.9 Back Counting



Figure 2.10 Internal Count of Temp.

Step 2: Then press FS982X Emulation Board S4 (PT2[1]), system enters into RTCmode.

Step 3. After several sec., press again FS982X Emulation Board S4 (PT2[1]), system will enter into Sleep Mode, LCD will have no sign now.

Step 4. Press again FS982X Emulation Board S4 (PT2[1]), system will re-start.

Step 5. Press S3 (PT2[0]) one time, LCD will show ADC value (internal temperature value), as shown in the Figure 2.10. During temperature test, ADC value can change up and downward via change of IC temperature. The shown temperature value in the Figure 2.10 will be different depending on the ambient condition.

When the 5 steps have been carried out, means the tests on the digital I/O, LCD, counter, etc. digital signal have been completed. Test on analog signal ADC with temperature has been completed. If there is any exception occurs, please check jumper and mode switch and other setting, or report the question to the agent or FSC.

2.4 A Basic Tutorial

2.4.1 General Description of Operation

For users' better understanding of the operation of FS982X IDE, this chapter explains first about operation of writing code, compiling, debugging, and OTP programming, etc., the contents include:

- (1) **Selection Device:** How to choose IC and RAM, the step has to be selected prior to writing code.
- (2) **Create a new file:** How to create a new file.
- (3) **Compiling:** How to compile files.
- (4) **Write Code:** Write code into file, this example is to write the I/O code into the file.
- (5) **Debug::** How to use register window, F_WATCH Window to debug.
- (6) **Programming:** Executive codes into OTP chip.
- (7) **OTP Testing:** use OTP to perform off-line operation

The a. m. 1~5 items can make FS9822 ICE to perform system simulation, and can make FS9822 OTP chip to perform programming test. Items 6~7 can be saved if users do not have OTP chip.

2.4.2 Selection of the Device

Select 『Options->Setup』 from the tool bar, the screen is as shown in the Figure 2.11.

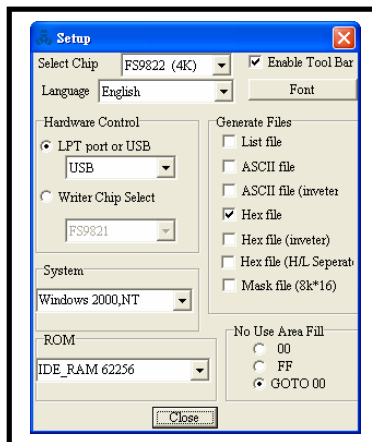


Figure 2.11 “Setup” Window

The notes for setup are as follows:

- **Select Chip:** Please choose suitable IC type No. from “select chip ver.”, such as FS9822 (4k).
- **ROM Selection:** Select IDE_RAM_62256 from “ROM”. (Selection of ROM is depending on memory of FS Control Board).
- **ICE Communication Protol:** Please select USB as the communication screen from “via LPT port or USB”.

2.4.3 Creating a New File

To create a new file, please select 『File->Open File』, as shown in the Figure 2.12, then select 『File->Save As』 to save this file. The file name is “main.asm”, and then add a folder in the access route C:\Program Files\FASM500, the name is “Tutorial (suggested)” then to save the file.

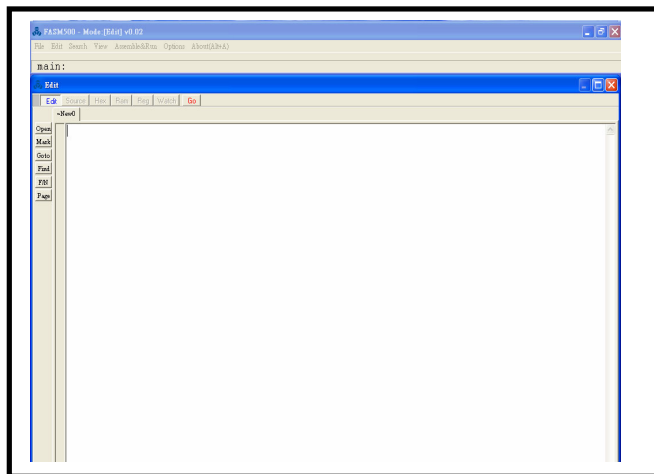


Figure 2.12 Window of 'Create a new file'

2.4.4 Compiling Files

Select compiling method from the tool bar: 『Assemble&Run->Debug Mode Set up->Hardware Emulation ID-Number:0』; and setup this file to be the compiled main file: 『Assemble&Run-> Set Main File』; then proceed compiling of this file: 『Assemble&Run->Assemble&Run』. After compiling, the screen is as shown in the Figure 2.13.

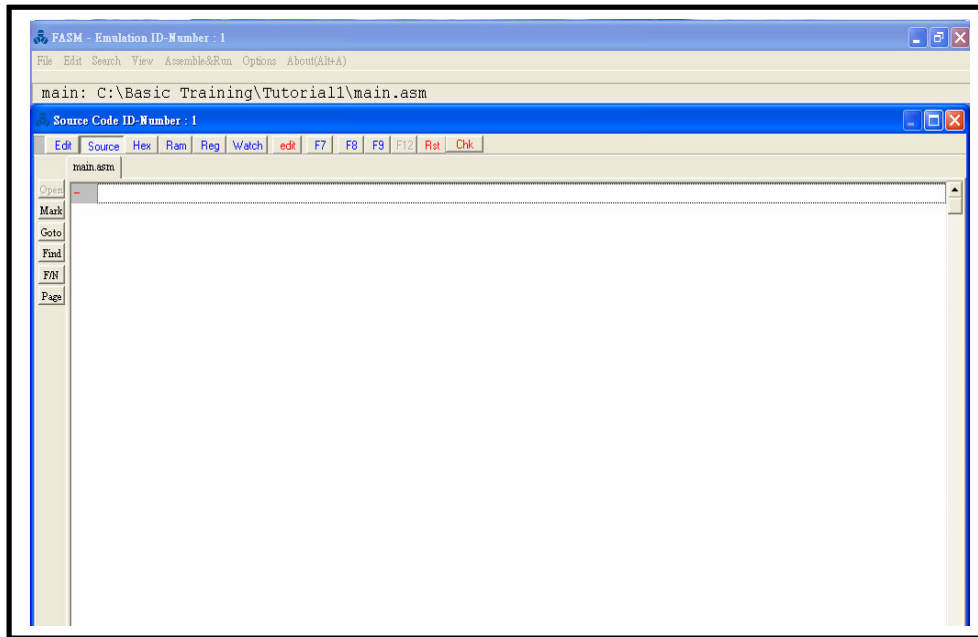


Figure 2.13 Window of Building a file

2.4.5 Writing Code

PT2 is setup to be an output port in this example, interrupt per second; ISR makes voltage of PT2 H/L output in turn.

Select 『Assemble&Run->Edit Mode』 to enter into writing code; in the meantime, to key in the following code into the edit window as shown in the Figure 2.14.

```

PT2D      equ    080h          ; PT2D
ORG        00H
GOTO      SYSINI
ORG        04H
GOTO      TimerISR

SYSINI:
CLKINI:
    MOVLW   00100001B          ;Set CLK Source & Timer
    MOVWF   MCK
    NOP

TIMERINI:
    MOVLW   00000000B          ;reset Timer
    MOVWF   TMCON
    MOVLW   10010000B          ;Set Timer Interrupt Enable
    MOVWF   INTE
    MOVLW   00001111B          ;Set Timer
    MOVWF   TMCON

PT2INI:
    MOVLW   00000000B          ;Set pull-up resistor
    MOVWF   PT2PU
    MOVLW   11111111B          ;Set I/O Port
    MOVWF   PT2EN
    MOVLW   11111111B          ;Set PT2D data
    MOVWF   PT2D

    MOVFW   PT2D               ;Set PT2 data
    MOVWF   PT2

MAIN:
    NOP
    GOTO    MAIN

TimerISR:
    CLRF    INTF               ;Clear Timer Flag
    COMF    PT2D,1             ;PT2 data invert
    MOVFW   PT2D               ;Set PT2 data
    MOVWF   PT2
    RETFIE

END

```

Figure 2.14 Template code

Select 『Assemble&Run->Assemble&Run』 to execute the code, the screen in the error message window will show the Figure 2.15.

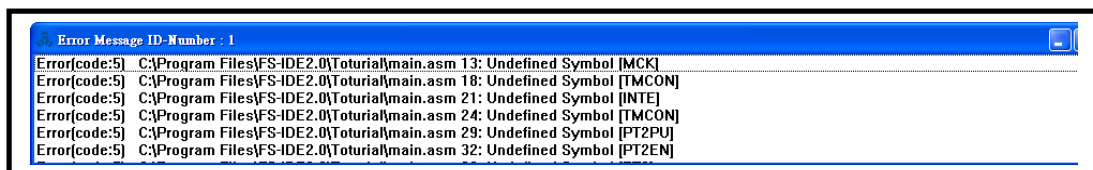


Figure 2.15 "Error Message" Window

Copy the file “FS9822.INC” under C:\Program Files\FASM500\FS982X\INCLUDE to your folder, and add this program as shown in the Figure 2.16.



Figure 2.16 Add Command

Then select 『Assemble&Run->Assemble&Run』 to compile this program, the screen is shown as the Figure 2.17.

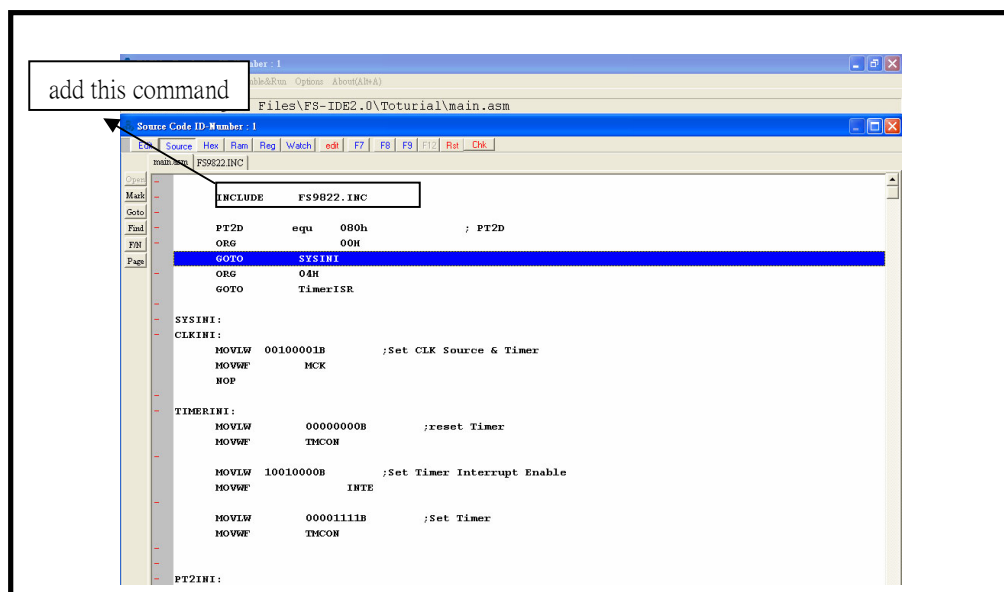


Figure 2.17 Screen of Building

2.4.6 Debug

When the screen transfers to “Source ID-Number : 0”, to select 『Assemble&Run->Breakpoint』 from the tool bar , or press the hot key F5 before code No. to setup the break point as follows:

Breakpoint 1: Set the breakpoint before the instruction “NOP” after the mark MAIN.

Breakpoint 2: Set the breakpoint before the instruction “CLRF INTF” after the mark TimerISR.

Breakpoint 3: Set the breakpoint before the instruction “REFTIE”.

After setup, the screen is as shown in the Figure 2.18.

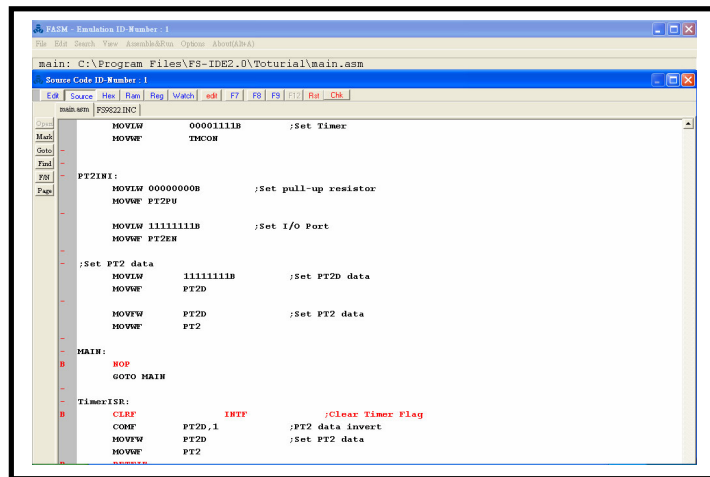


Figure 2.18 Finished Break Points

To select 『Window->Register』 from the tool bar, “Register Window” shows immediately, then select 『Assemble&Run->Run』 or press the hot key F9, the register window will show as the Figure 2.19, program stops at the instruction “NOP”.

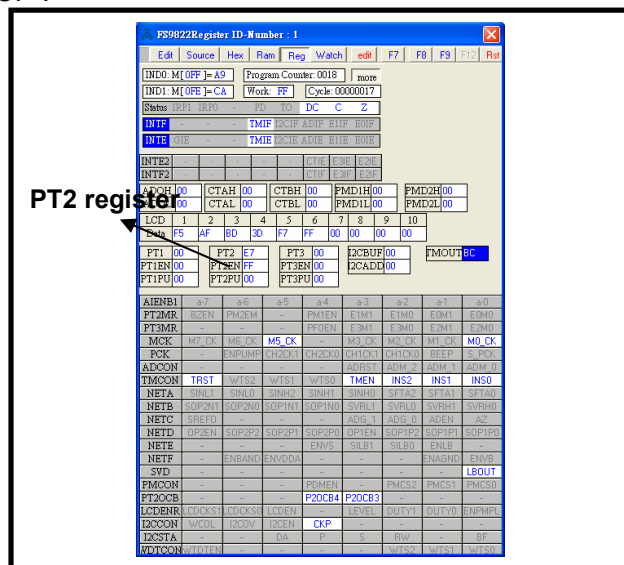


Figure 2.19 “Register” Window

The screenshot shows the F-Watch software interface. The window title is "F-WATCH". The menu bar includes "Edit", "Source", "Hex", "Ram", "Reg", "Watch", "edit", "F7", "F8", "F9", "F12", "Rst", and "Chk". The main display area is a table with columns: "Name", "Addr", "Hex", "Bin/Refered Symbol", and an empty column. The first row of the table contains the value "0" in the "Bin/Refered Symbol" column. The interface has a blue border and a scroll bar on the right.

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2.4.7 Program

There are 3 steps in the programming action: exchange of hardware, setup of software, setup of programming utility. In this chapter we will show users how to program code to OTP chip.

(1) Exchange of Hardware

- Hardware set up: Use OTP's Transfer Board to replace ICE's Transfer Board, and set up the location of FS982X ICE's jumper.

(2) Set up of Software

- 『Options->Setup』 set up: Selection of “OTP” chip type and “ROM”.
- Compiling file: Building file and enter into programming interface.

(3) Setup of Programming Utility

- Load file: Open programmed file.
- Programming setup: programming selection setup and programming.
- Programmed file verification: use software to confirm the programmed file to see if it is correct.

Note: If manufacturers like to program in bulk, FSC offers the programming service.

● Setup of Hardware

Step 1. Replace ICE Transfer Board: to replace the ICE Transfer Board to be OTP Transfer Board.
Step 2. Change J11 jumper: to change the J11 of FS982X from “Normal” to be “Program”.

After setup, it is shown as the Figure 2.22.

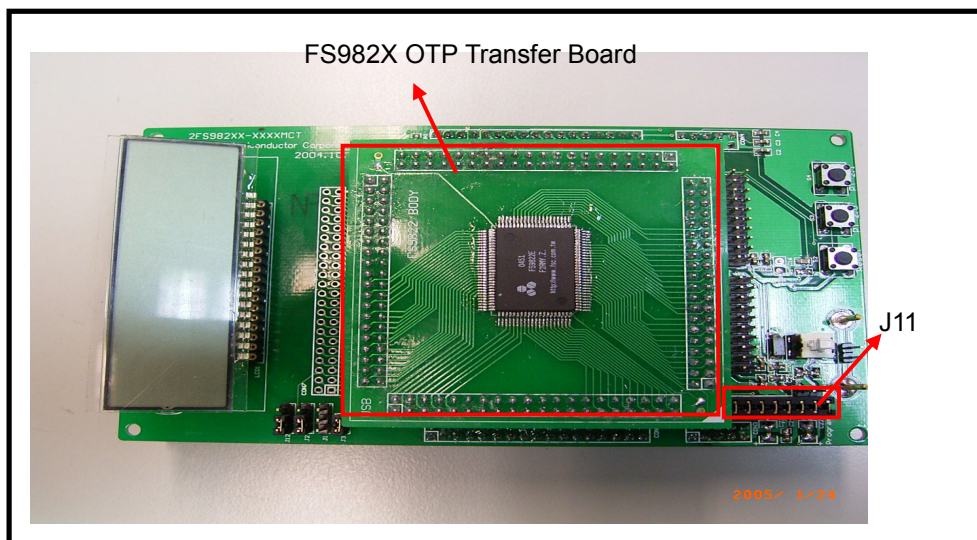


Figure 2.22 Complete FS982X ICE

● Set up of 『Options->Setup』

Select 『Options->Setup』 in the tool bar, as shown in the Figure 2.23, please set up by the following steps:

- Step 1. Select Chip: Select suitable IC type, such as FS9822(4k) from “Select Chip “.
- Step 2. Hardware Control (Communication): Select “USB” from “via LPT port or USB” to be the communication protocol.
- Step 3. ICE Control (Programming): Select chip type, such as FS9822&FS6811 from “Write Chip Select”.
- Step 4. Assemble File Setup: Select the option of ‘Hex file’ in generate files.
- Step 5. ROM Select:, Select IDE_RAM 62256 from “ROM”.

Note: The IC selection at Step 1 and Step 3 should be the same, or unexpected error will occur.

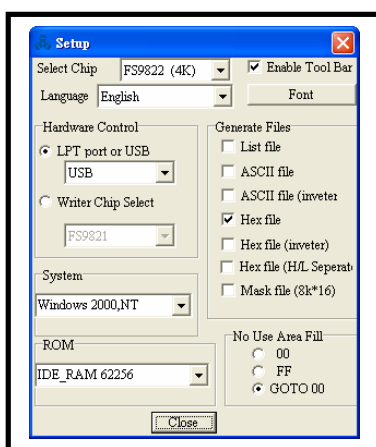


Figure 2.23 『Options>Setup』 Window

● Compiling Files

Select compiling method: 『Assemble&Run->Set Mode -> Emulation ID-Number:0』 from the tool bar, and set the file to be the main program compiled: 『Assemble&Run->Set Main File』; then use this file to proceed compiling 『Assemble&Run->Assemble&Run』. After compiling, the screen is as shown in the Figure 2.24.

Please confirm that the “Emulation chip mode” and the “programmed chip” are the same.

Please open the file you like to compile, if steps 1~5 of the Basic Tutorial have not been executed.

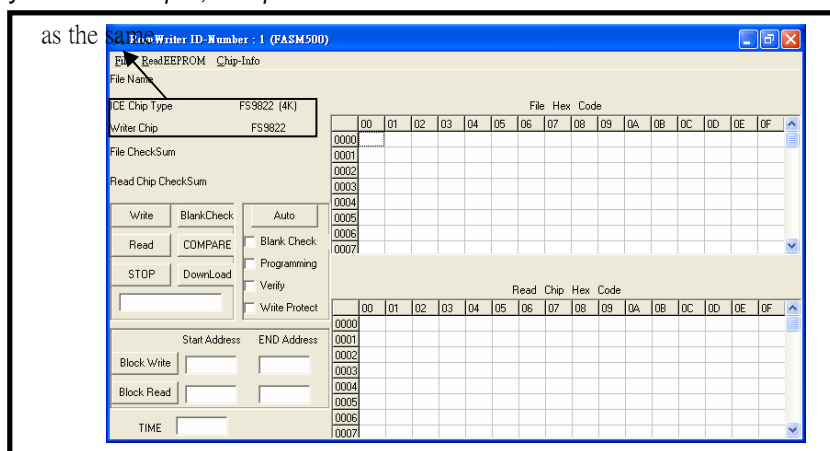


Figure 2.24 Window of After Compiling

● Loading in Files

Before loading in file, please select “Blank Check” from the window to check whether OTP chip ROM is blank. If it is, it shows as the Figure 2.25(a), if not, it will show as the Figure 2.25(b). Select programmed file 『File->Open』 from the tool bar, usually the file name is “*.hex”; in this example, the file name is “main.hex”. After loading in file, the screen is shown as the Figure 2.26. To check whether loading in file is correct or not has to see “successful” appears in the screen.

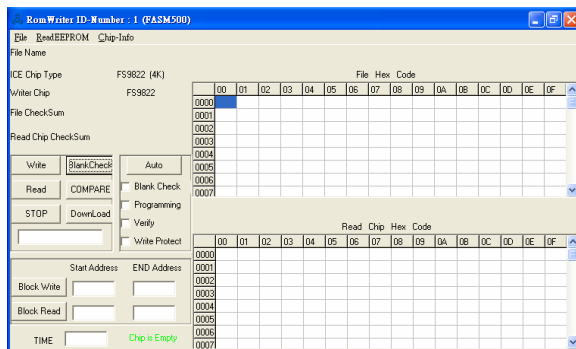


Figure 2.25(a) chip empty

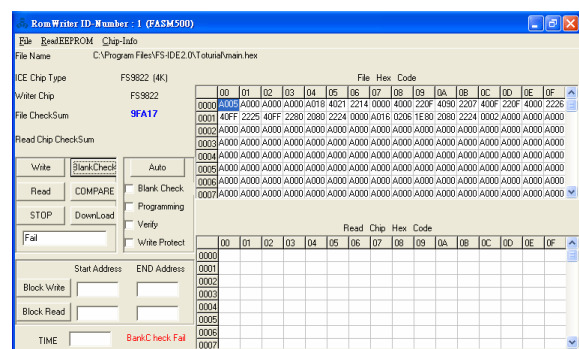


Figure 2.25(b) chip not empty

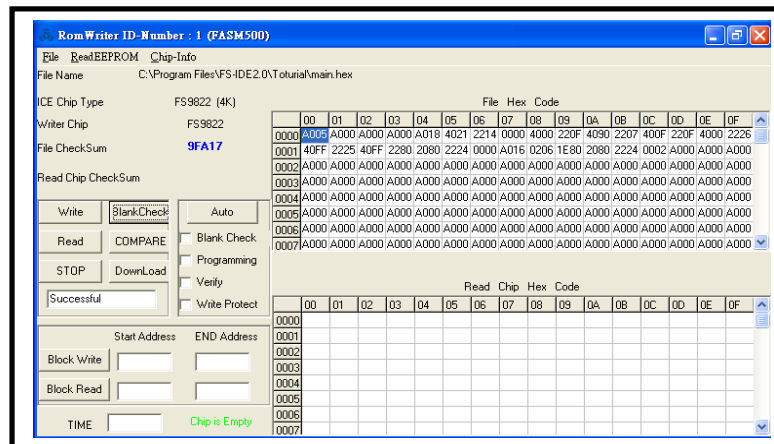


Figure 2.26 Loading file screen

- **Setting up Programming Tool**

Please select from the options “Programming” and “Verify”, and select “Auto”, the screen of setup of programming is as shown in the Figure 2.27, the completion of programming is as shown in the Figure 2.28.

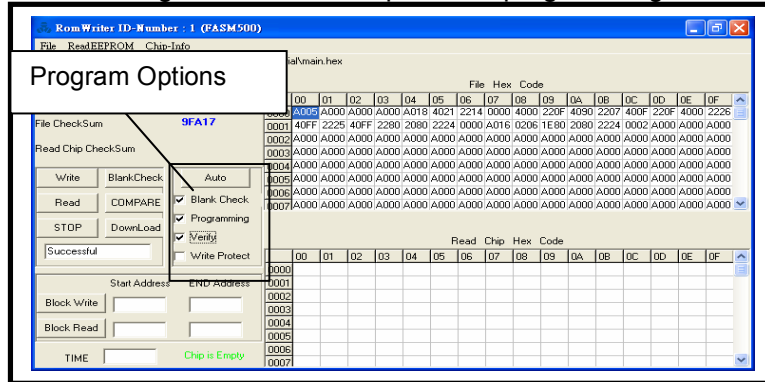


Figure 2.27 Programming Setup Screen

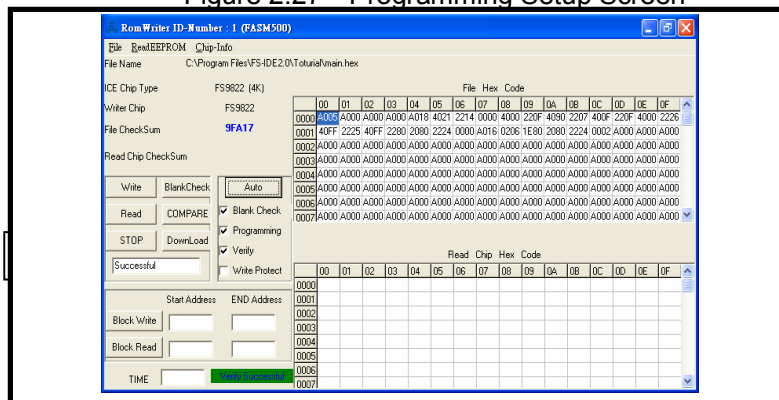


Figure 2.28 Successful Programming Screen

● Verification of Programming Files

Programming utility provides program code verification function, please select “Compare” in the screen, the right screen is as shown in the Figure 2.29; error is shown as the Figure 2.30.

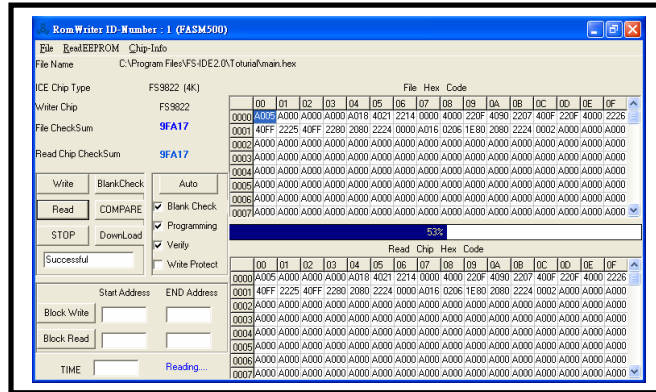


Figure 2.29 Correct Verification Screen

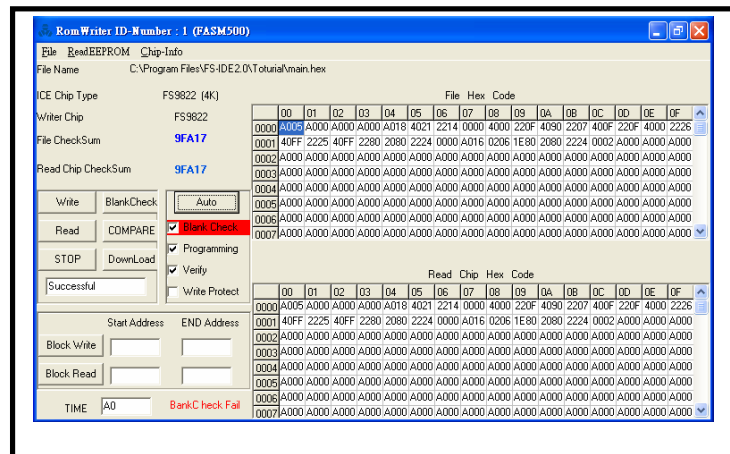


Figure 2.30 Error Verification Screen

2.4.8 OTP Test

After successfully complete the programming steps by following the section 2.4.7, the code has been programmed into FS982X OTP chip. If users like to test the chip after programming, please follow the following steps.

- Step 1. Remove USB wire from FS Control Board.
- Step 2. Add 3V power source between J13 and J14.
- Step 3. Switch J11 from “Program” to “Normal”.
- Step 4. Close power switch S1.

In this case, verification of H/L voltage per sec. at all I/O port of PT2 can be measured.

2.4.9 Conclusion

Main contents introduced in this section include:

- (1) Selection of device.
- (2) Creating a new file and writing an example code for one section about I/O port.
- (3) Compiling and debugging by window.
- (4) Programming code to OTP chip.
- (5) OTP test

Certain understanding to create a new file, writing program, compiling has been built up via the a. m. operation, detailed introduction of each option of FS982X IDE can be found in the following chapters.

3. Tool Bar of FS982X IDE

3.1 General Description

FS982X IDE provides a perfect tool bar, including seven options: File, Edit, Search, Window, Compile & Execution, Option and About (Alt+A), as shown in the Figure 3.1. It is convenient for users to proceed writing and debugging operation.

The tool bar of FS982X IDE also provides program access, users can find where the program comes from. The tool bar is shown as the Figure 3.1.

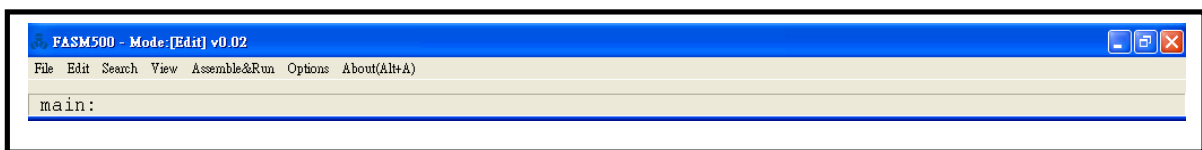


Figure 3.1 Tool Bar Window

3.2 File

This option is for file reading&writing/editing, please move the mouse to the Option 『File』 in the tool bar and click the left button, pull down the options as shown in the Figure 3.2.

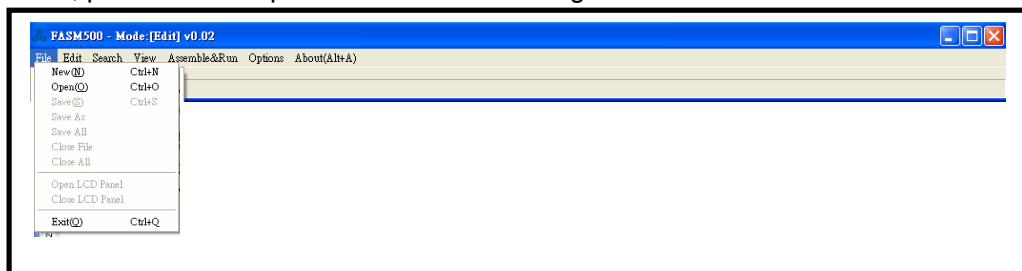


Figure 3.2 Menu of 『File』

- **New (N) (Ctrl+N):** Create a new file or press the hot key Ctrl+N to create a new file
- **Open (O) (Ctrl+O):** Open the old file or press the hot key Ctrl+O to open the old file
- **Save (S) (Ctrl+S):** Save the file just operated in the window or press the hot key Ctrl+S to save the file
- **Save As...:** Save the file just operated in the window by another name
- **Save All:** Save all of the opened files
- **Close File:** Close the file just operated in window
- **Close All:** Close all of the opened files
- **Open LCD Panel:** This function is not provided for the time being
- **Close LCD Panel:** This function is not provided for the time being
- **Exit (Q)(Ctrl+Q):** System is shut down

3.3 Edit

Move the mouse to the tool bar “Edit” and click the left button, click the options as shown in the Figure 3.3:

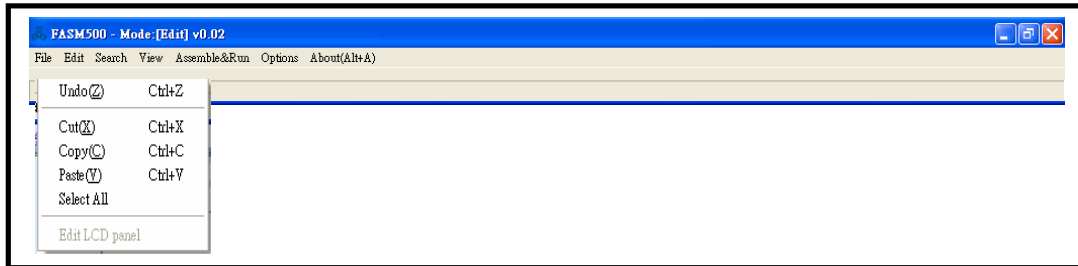


Figure 3.3 『Edit』 Menu

- **Undo (Z)(Ctrl+Z)** :Return to the last step, or press the hot key Ctrl+Z to execute.
- **Cut (X) (Ctrl+X)**: Cut off the marked strings into buffer, or press Ctrl+X.
- **Copy (C) (Ctrl+C)**: Copy the marked strings into buffer, or press Ctrl+C.
- **Paste (V) (Ctrl+V)**: Paste the contents of buffer into the position of cursor, or press Ctrl+V.
- **Select All**: Select all contents of the file.
- **Edit LCD Panel**: This function is not provided now.

3.4 Search

Please move the mouse to the tool bar 『Search』, to click the left button and pull down the options as shown in the Figure 3.4.

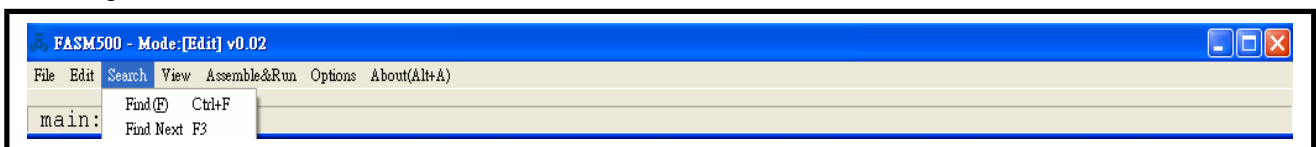


Figure 3.4 『Search』 Menu

- **Find(E)(Ctrl+F)**: Search the compatible string in this file, or press Ctrl+F.
- **Find Next (F3)**: Search the next compatible string in this file, or press F3.

3.5 View

Please move the mouse to the tool bar “View”, and click the left button, pull down the options as shown in the Figure 3.5.

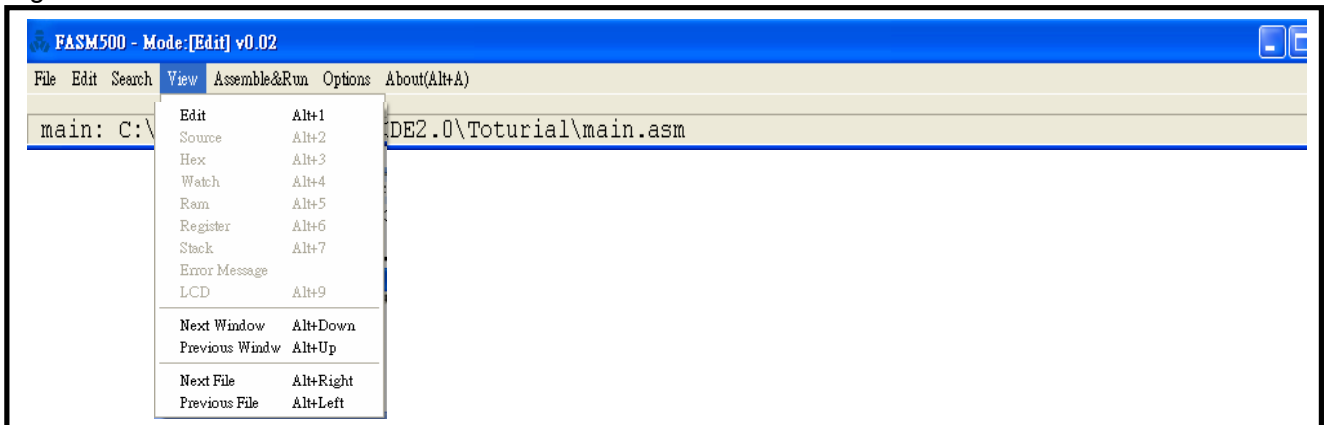


Figure 3.5 『Window』 Menu

- **Edit(Alt+1):** Enter into Edit Window
- **Source (Alt+2):** Shows only when soft/hardware emulation/simulation, press this option will jump to “Source”. Please refer to chapter 4.3.
- **Hex (Alt+3):** Shows only when soft/hardware emulation/simulation, press this option will jump to “Hex”. Please refer to chapter 4.4.
- **Watch(Alt+4):** Shows only when soft/hardware emulation/simulation, press this option will jump to “F_WATCH”. Please refer to chapter 4.7.
- **Ram(Alt+5):** Shows only when soft/hardware emulation/simulation, press this option will jump to “Ram”. Please refer to chapter 4.5.
- **Register (Alt+6):** Shows only when soft/hardware emulation/simulation, press this option will jump to “Register”. Please refer to chapter 4.6.
- **Stack (Alt+7):** Shows only when soft/hardware emulation/simulation, press this option will jump to “Stack”. Please refer to chapter 4.8.
- **Error Message:** Shows only when soft/hardware emulation/simulation, press this option will jump to “Error Message”.
- **LCD Window (Alt+9):** Not provided yet.
- **Next Window (Alt+Down) 、 Previous Window (Alt+Up):** For each window screen switching
- **Next File ((Alt+Right) 、 Previous File (Alt+Left):** Display and switch opened files in Edit Window

3.6 Assemble & Run

Please move the mouse to the tool bar 『Assemble & Run』 and click the left button, pull down the options as shown in the Figure 3.6.

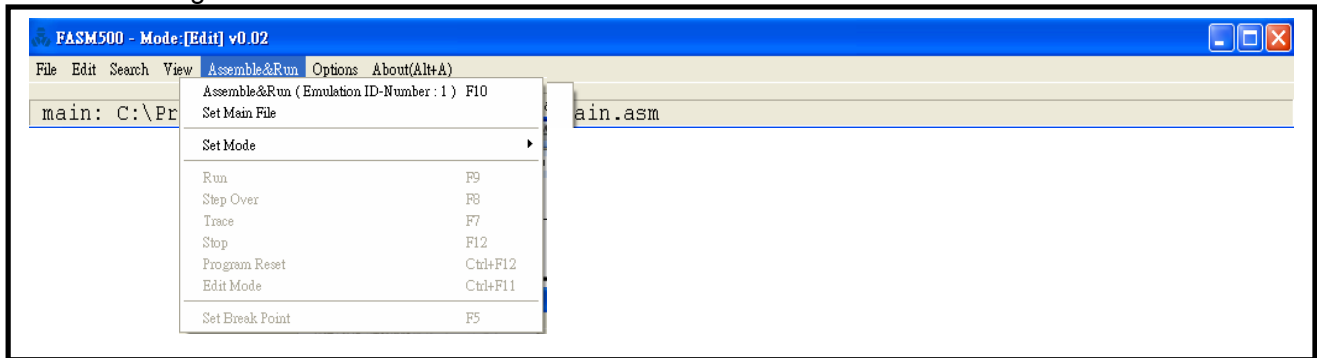


Figure 3.6 『Assemble&Run』 Menu

- **Assemble & Run (F10)** : Compiling files, and proceed soft/hardware emulation/simulation.
- **Set Main File**: Setup the file in the operated window to be the main compiled document.
- **Set Mode**: Setup emulation or simulation.
- **Run (F9)** : Continuously execute loaded code, program keeps being executed to the setup breakpoint, then stop.
- **Step Over (F8)** : Step Over, trace to the code, i.e. not enter into Macro and sub-program
- **Trace (F7)** : Trace, detailed trace to the code, i.e. enter into Macro and sub-program
- **Stop (F12)** : Stop program counter right now, and halt program counter.
- **Program Reset (Ctrl +F12)** : Reset program counter to zero.
- **Edit Mode (Ctrl +F11)** : Press this option will jump to Edit Mode from simulation status.
- **Set Break Point (F5)** : Numbers of break point will depends on chip type or simulation/emulation status.

3.7 Options

Move the mouse to 『Option』 in the tool bar and click the left button to select the options as shown in the Figure 3.7.

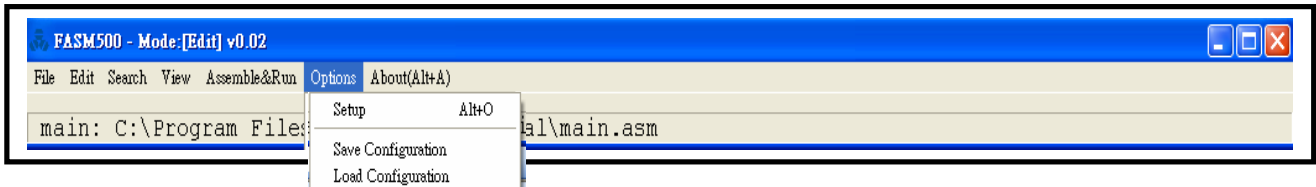


Figure 3.7 『Options』 Menu

- **Setup (Alt+O):** Select chip type and other relevant setup, please refer to chapter 4.9.
- **Save, Load Configuration:** Save or load configuration value. “For read only” should be released in advance, when copy “FASM500” from a disc to hard disc.

3.8 About

Move the mouse to 『About (Alt+A)』 in the tool bar and click the left button, the screen is as shown in the Figure 3.8 to display the software modification history.

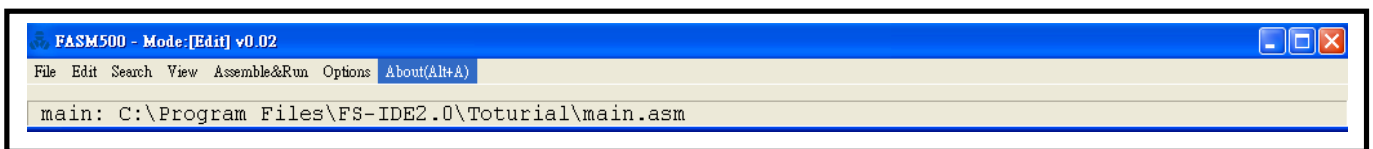


Figure 3.8 『About (Alt+A)』 Window

4. Windows of FS982X IDE

4.1 General Description

FS982X IDE provides perfect windows for users to proceed software/hardware simulation and emulation operation as shown in the Figure 4.1. 10 windows are provided under the simulation condition, the method is to move the mouse to the tool bar option 『Window』 and click the left button, the screen of windows are as follows:

- Edit Window
- Source Window
- Hex Window
- RAM Window
- Register Window
- F_WATCH Window
- Stack Window
- Error Message Window
- LCD Window
- Setup Window

Debug operation provides “immediate modification” function, convenient for users to perform immediate modification to the value of ram and register.

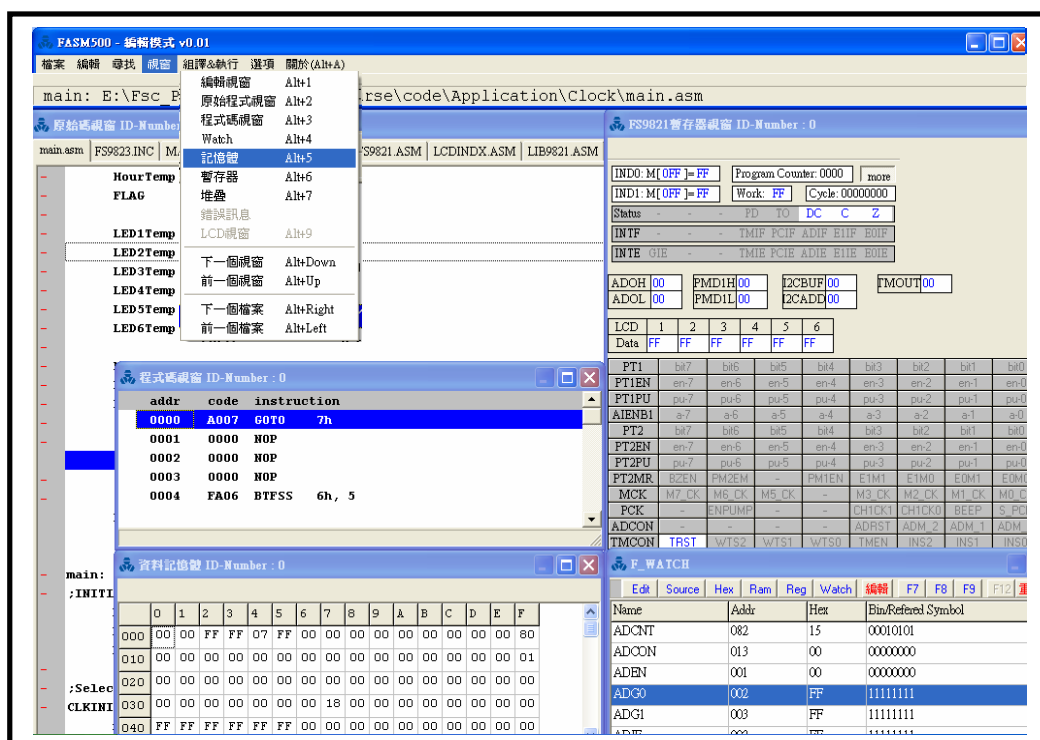


Figure 4.1 FS982X IDE Window

4.2 Edit Window

Edit Window of FS982X provides users personalization operation screen, whose function has 4 parts: Hot Keys, File Tabs, Function Keys, and Edit Area, as shown in the Figure 4.2. The operation display will show up immediately as “FASM500” is started.

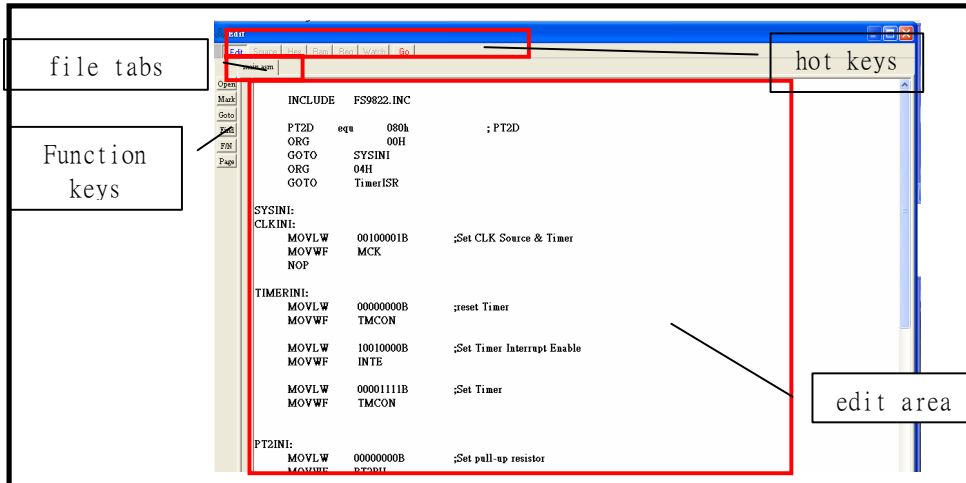


Figure 4.2 “Edit” Window

(1) Hot Keys

- **Edit:** Press Edit button, the system will show “enable status”.
- **Source:** Press Source button, the screen will jump to “Source” only after entering into soft/hard ware simulation/emulation. Please refer to the Figure 4.4.
- **Hex:** Shows only when soft/hardware emulation/simulation, press this option will jump to “Hex”. Please refer to chapter 4.3.
- **Ram:** Shows only when soft/hardware emulation/simulation, press this option will jump to “Ram”. Please refer to chapter 4.5.
- **Reg:** Shows only when soft/hardware emulation/simulation, press this option will jump to “Reg”. Please refer to chapter 4.6.
- **Watch:** Shows only when soft/hardware emulation/simulation, press this option will jump to “F_WATCH”. Please refer to chapter 4.7.
- **Run:** Enter into Execution from Edit, and shows “Source”.

(2) File Tabs

Display the name of an opened file.

(3) Function Keys

- **Open:** Open old files
- **Mark:** Setup or cancel tab, 10 (0~9) tabs can be setup maximum, can be used with “Goto” at the same time.
- **Goto:** Can be used with “Tab”, the purpose is for a fast change to the location of tab.
- **Find:** Search compatible string in Edit Area.
- **F/N:** Keep on searching the specified string.
- **Page:** Page of Edit.

(4) Edit Area

Program of an opened file can be revised.

4.3 Source Code Window

"Source" Window of FS982X provides users with a screen displaying execution logic debug, whose function has 5 parts: Hot Keys, File Label, Function Keys, Debug Area and Program Info., as shown in the Figure 4.3, after users execute compiling works, the window will show up.

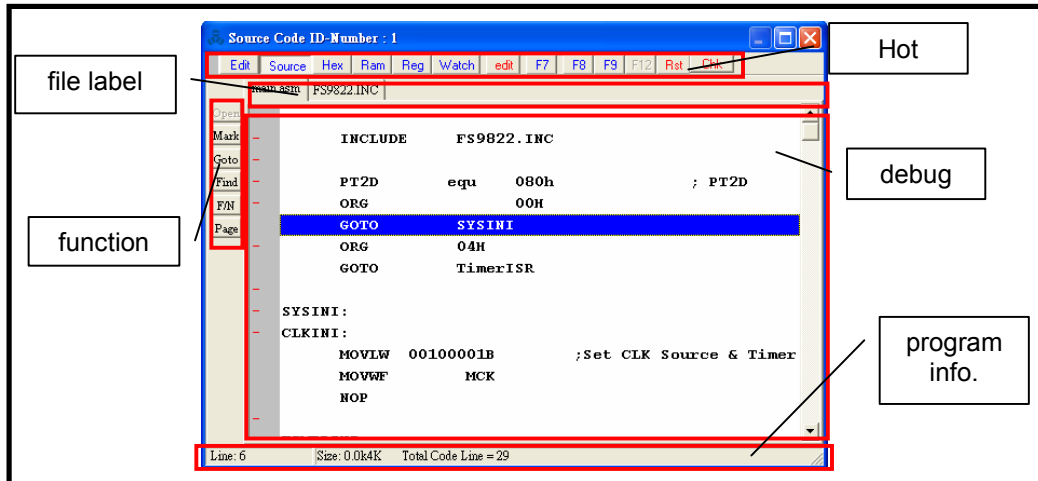


Figure 4.3 "Source" Window

(1) Hot Keys

- **Edit:** Press "Edit" button, select this option can modify code.
- **Source:** Select this option the screen will jump to "Source" for debug.
- **Hex:** Select this option the screen will jump to "Hex", please refer to 4.4.
- **Ram:** Select this option the screen will jump to "Ram", please refer to 4.5.
- **Reg:** Select this option the screen will jump to "Reg", please refer to 4.6.
- **Watch:** Select this option the screen will jump to "F_WATCH", please refer to 4.7.
- **Edit:** Return to Edit Mode from Execute Mode, and shows "Edit" for modifying code.
- **Trace (F7):** Detailed trace to the code, i.e. enter into Macro and sub-program
- **Step Over(F8):** Trace to the code, i.e. not enter into Macro and sub-program
- **RUN(F9):** Execute program
- **STOP(F12):** Halt program
- **Program Reset (Rst):** Reset program counter.
- **Chk:** Check the chip data between FS Control Board and Compiler.

(2) File Labels

Entering into Debug Mode, file labels will display names of all complied files.

(3) Function Keys

- Open: Open Compiled files.
- Mark: Setup or cancel label, 10 (0~9) labels can be setup maximum, can be used with "Goto" at the same time.
- Goto: Can be used with "Label", the purpose is for a fast change to the location of label.
- Find: Search the compatible string in this file.
- F/N: Keep on searching the specified string.
- Page: Page of Edit.

(4) Debug Area

- **Location of Program Execution:** The location of the blue cursor is the halt position of program.
- **Setup Break Point:** Set the breakpoint "B" of program, i.e. the system will stop at this position.
The numbers of breakpoint will depend on different type of chips or status of simulation/emulation.

Table4.1 FS982X Soft/Hard ware Breakpoint

IC types	Soft. Interrupt	Hard. Interrupt
FS9821	10	3
FS9822	10	3
FS9823	10	3

(5) Program Info.

- Location of Program Execution: Where the program is executed, located in the down left corner of the Figure 4.3.
- Size of Program: Calculates and shows code size of user's program, i.e. min. unit is 0.1k byte

4.4 Window of Program Memory

If the compiler wants to enter into Code, press 『View->Hex』 or "Hex" in "Source" after user compiles the program. The interface will display the address, machine code and instructions where the compiled code is saved, as shown in the Figure 4.4, i.e. the value will show by 16 hex.

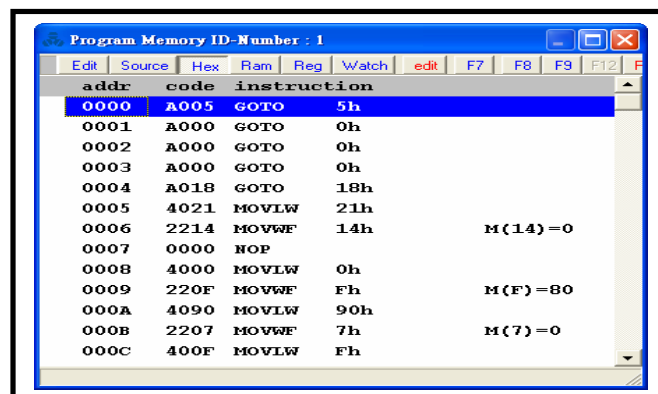


Figure 4.4 "Source" Window

4.5 Window of Data Memory

If the compiler wants to enter into Ram, press 『View->Ram』 or “Ram” in “Source” after user compiles the program. The interface will display the contents of each address (0x00~0x1FF) of ram, and the immediate modification function under debug environment, as shown in the Figure 4.5, i.e. the value will show by 16 hex.

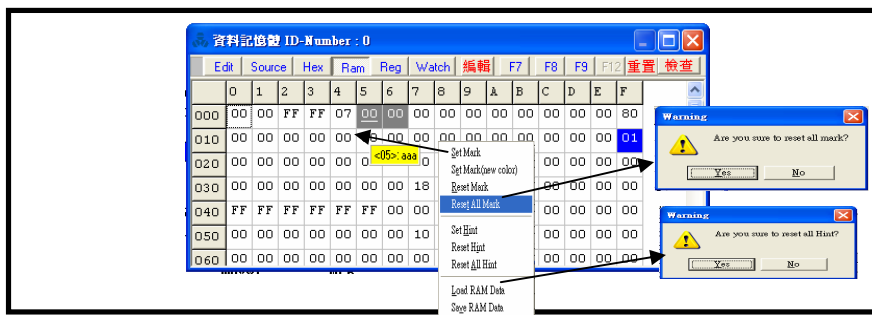


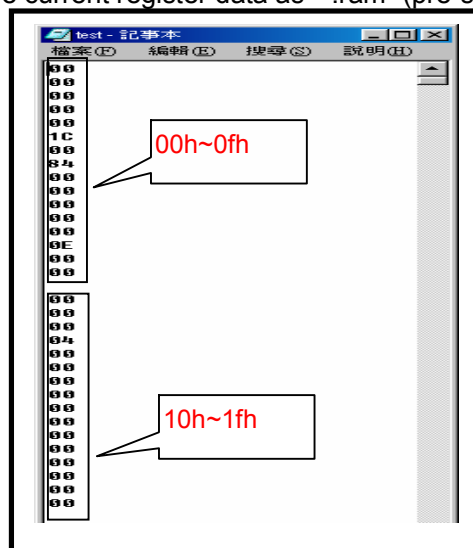
Figure 4.5 “RAM” Window

Note: When the data written into register is different from previous, the address of register will be highlighted in blue to indicate any change of data.

- **Set Mark:** Mark register, the displayed color can be set from “**Set Mark (new color)**”.
- **Set Mark (new color) :** Set “**Set Mark**” color, as shown in the Figure 4.6 after clicking the options.



- **Reset Mark/Reset All Mark:** Clear “**Set Mark**” function, click “**Reset All Mark**” will show the confirmation window, as shown at the up right side in the Figure 4.5.
- **Set Hint:** Setup expected value of register data, when the cursor is moved to the address of the register will show a yellow hint.
- **Rest Hint/Rest All Hint:** Clear “**Set Hint**” function, click “**Reset All Hint**” will show the confirmation window, as shown at the down right side in the Figure 4.5.
- **Load RAM Data:** Load in “data register” file format; respectively load in “.ram” files. The file format is shown as the Figure 4.7.
- **Save RAM Data:** Save current register data as “*.ram” (pre-set) file for easier to compare data.



4.5.1 Revision of Register Label

Difficulties will be increased under debug environment usually due to unknown label of the address. If the mouse points to the register, the address label will be displayed, and then the contents of the register can be read directly. The address in this example is 07h, the setup label is test, and the set steps are as follows:

Step 1. Open 'RAM' window, select the address 07h and click the right button of the mouse, to select "Set Hint" from the window options.

Step 2. Pop out of window, and enter into the label "test".

Step 3. When move the mouse to the address 07h, the yellow block will show up and displays the label for users to check if it is correct. The yellow block displayed format is as follows: <address>: Label, like:<07>: test.

4.5.2 Revision of RAM Data

If users like to change values of some certain addresses under debug environment, the steps are as follows:

Step 1: Open "RAM" Window, select the memory address supposed to be changed, and double click the left button of the mouse, the "RAM Modification" Window will show up.

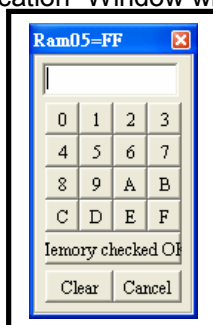


Figure 4.8 "RAM Modification" Window

Step 2. Input the value via key board or screen key board.

Note: Not every address can access modification in RAM address, such as 00H of FS982X can't be changed. For details, please refer to 《FS982X data sheet》.

4.6 Register Window

If users like to enter into Register window, may press 『View->Register』from the tool bar, or press “Reg” from “Source” after compiling. The window will show the contents of the register depending on the chip type, as shown in the Figure 4.9. Register Window displays contents of the special register, including program counter, execution cycle, LCD and special register, and provides immediate modification service under debug environment. The contents displaying method is by 16 Hex., status shows in byte.

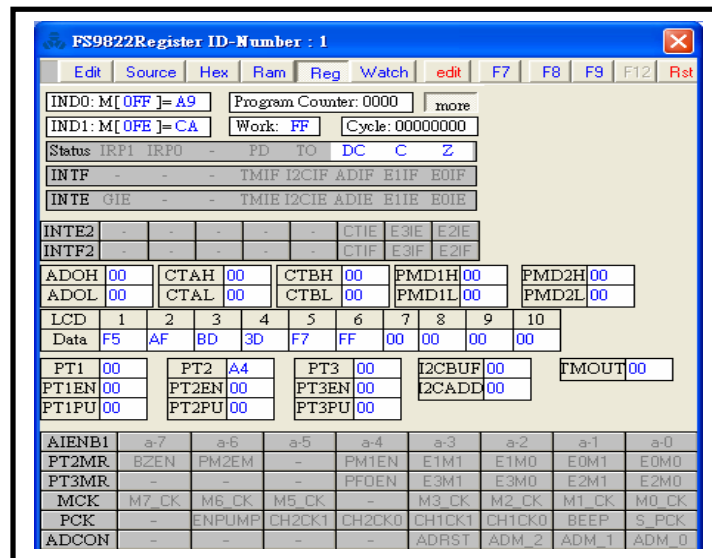


Figure 4.9 Register Window

Note: For detailed description of register name and definition, please refer to 『FS982X data sheet』.

4.6.1 Revision of Register

If users want to change values of some registers under debug environment, for example, to change the setup of “NETD->SOP1P0” to be 1, the steps are as follows:

- Step 1, open “Register”, select the register “NETD->SOP1P0” and click the left button of the mouse, “Register Modification” will show up, as shown in the Figure 4.10.
- Step 2, use mouse to select the status supposed to be changed, set 1.



Figure 4.10 “Register Modification” Window

4.7 F_WATCH Window

If users like to enter “F_WATCH” window, may select 『View->Watch』 from the tool bar, or press “Watch” in “Source” after compiling, this window provides numeric tracing function, as shown in the Figure 4.11.

“F_WATCH” window displays the value defined by users. Besides, “bit tracing” function is also provided, it is convenient for users to see the change of each byte. Window displays as following:

- Defined name
- Defined name address
- Value by 16 Hex
- Address or Value by Binary Display

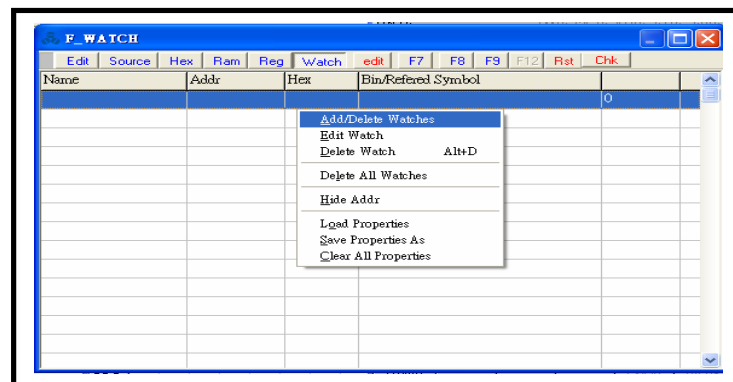


Figure 4.11 “F_WATCH” Window

Menu

Add/Delete Watches: Select this option will show “F_ADDWCH” Window. This window displays added or deleted label, as shown in the Figure 4.12.

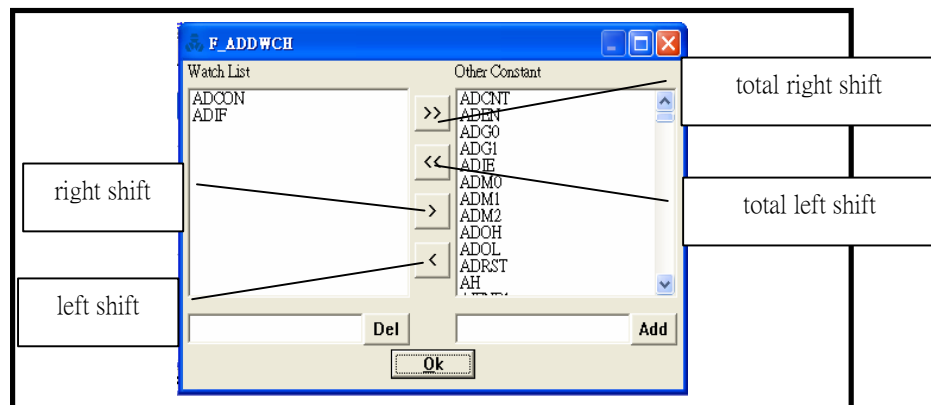
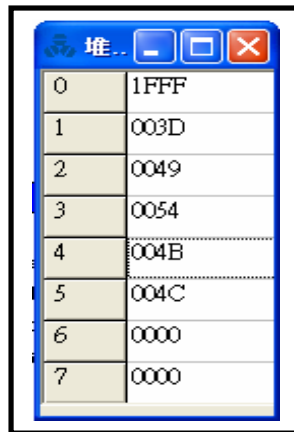


Figure 4.12 “Add/Delete” Window

- **Edit Watch:** Under this window the referenced value at specified address can be changed.
- **Delete Watch:** Can directly delete label in “F_WATCH”
- **Delete All Watches:** Can directly delete all labels in “F_WATCH”
- **Hide Addr:** Hide label at the register address
- **Load Properties:** Load all the “F_WATCH” saved files, the extension name of the file is defined as “*.pro”.
- **Save Properties As:** Save the Ram label listed in “F_WATCH”, the extension name of the file is “*.pro”
- **Clear All Properties:** Clear all the opened Properties.

4.8 Stack Window

If users like to enter into “Stack” Window, may select 『View->Stack』from the tool bar after compiling. When write sub routine, the programmer cares about pushing and popping execution address very much, FS982X IDE provides “Stack” for watching address, as shown in the Figure 4.15. FS982X chip provides 8 stacks max. “Stack” will display stack address of code, and provides on-line modification service, the contents is displayed by 16 Hex.



0	1FFF
1	003D
2	0049
3	0054
4	004B
5	004C
6	0000
7	0000

Figure 4.15 “Stack” Window

4.8.1 Remolding Stack Address

FS982X IDE provides immediate modification function under debug environment (suggested not to use), the setup steps are as follows:

Step 1, Open “Stack” Window, select the stack address supposed to be modified and double click the left button of the mouse, “Ram Modification” will show up as shown in the Figure 4.8.

Step 2, Input the value via key board or screen key board.

Note: The number of Stack level of each type of chip is not all the same, such as FS9821, provides only 6 level stack. For details, please refer to 《FS982X data sheet》.

4.9 Error Message Window

During compiling, “FASM500” provides code analysis function; detect errors to variable name and instruction format. If any error occurs during compiling code, “Error Message Window” will show up, as shown in the Figure 4.17. The format of error message will be displayed in Error Message Window, consisted of “Message Code”, “File Label”, “Column” and “Description”, as shown in the Figure 4.16.

[Error code]	[Error label]	[Error column]:	[Error description]
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Figure 4.16 Error Message Format

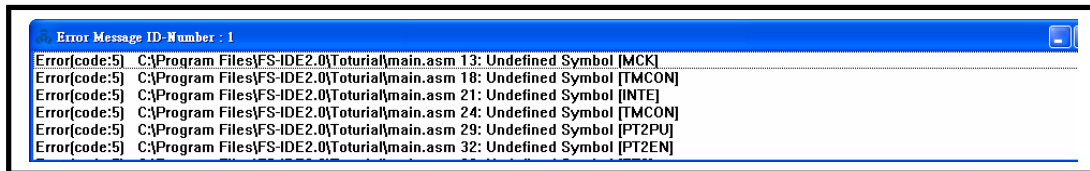


Figure 4.17 “Error Message” Window

4.10 LCD

This function is not provided by FS982X IDE for the time being.

4.11 Setup Window

Like to enter into 'Setup Window' press 『Options->Setup』 from the tool bar, as shown in the Figure 4.18, the setup items are as follows:

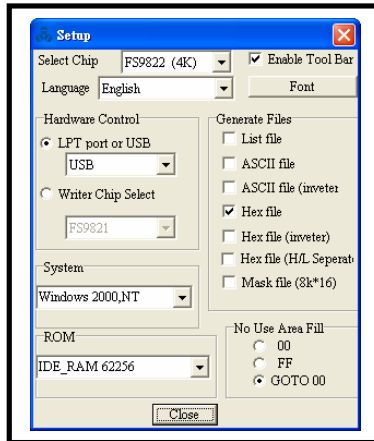


Figure 4.18 "Setup" Window

- (1) **Select Chip:** Select device of compiling, such as FS9822(4K)
- (2) **Language:** Choose Chinese or English
- (3) **Font:** Choice of Font
- (4) **ICE Control:**
 - **Via LPT port or USB:** Communication interface can support USB or LPT options, system provides 378h(LPT1) 、3BCh 、278h and USB.
 - **Select programmed chip:** Users can select program type SPI (Serial Port Interface) or Boot loader type. System provides: FS9823&FS3866,FS9822&FS6811, FS9821, FS9811, FS9855, FS9824, SPI_1K, SPI_2K, SPI_4K, SPI_8K and SPI_16K.
- (5) **Operation System:** Users may choose Windows 98 or Windows NT operation system, users of Windows XP may choose 'Windows NT' System.
- (6) **ROM:** Buffer for data program/execution, options of memory are "RAM62256", "EEPROM28C256"
- (7) **Generate Files:** From compiling, providing for chip.
 - List File: Providing compiling results, the file extension name is "*.lst".
 - ASCII File: For internal test, the file extension name is "*.asc".
 - ASCII File (inverse): For internal test, the file extension name is "*_invert.asc".
 - Hex File: Hex file is provided for programming, the file extension name is "*.hex".
 - Hex File (inverse): H/L byte exchange, for internal test, the file extension name is "*_invert.hex".
 - Hex File (L/H Separate): For internal test, the file extension name is "*_H.hex" and "*_L.hex".
 - MaskFile (8k*16): For internal test, the file extension name is "*_H.msk" and "*_L.msk"
- (8) **No Used Area Fill:** Can choose 00, FF or GOTO 00 to fill the non-used area of code, "GOTO 00" is suggested for avoiding error of code..

5. Debug of FS982X IDE

5.1 General Description

It is unavoidable to repeat modification and test on the original program during program development process. FS982X provides much more convenient for debug utilities, and shorten the development time. These functions include: Single step execution, setup breakpoint, tracking trigger condition, etc. This chapter mainly introduces the debug functions in three aspects:

- **Reset FS982X system**
- **Hardware emulation of application program**
- **Setup breakpoint**

Debug can be executed only after compiling; the code marked in blue in “Source” window as shown in the Figure 5.1 will be the first code to be executed. It means system is ready to accept and execute the debug order from the users.

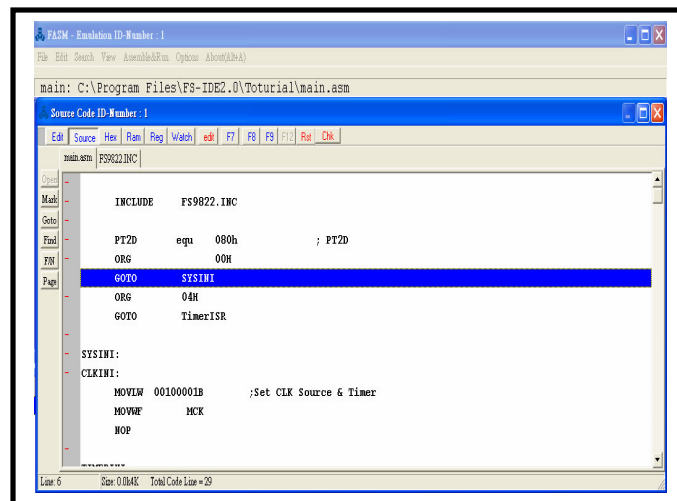


Figure 5.1 Screen after compiling

5.2 Reset FS982X System

3 kinds of Reset as follows are provided by FS982X IDE:

- **Hardware system reset:** Use button S2 of FS982X ICE to reset system.
- **Power source reset:** Use switch S1 of FS982X ICE to reset system.
- **Software reset:** Execute 『 Assemble&Run->Program Reset 』

Table 5.1 Results of 3 kinds of Reset

Function	Hardware System Reset	Power Source Reset	Software Reset
Clear Special Register	*	*	*
Clear Memory	N	N	N
Program Counter (PC)	0 * *	0 * *	0(Stop)
* * * Clear Software Setting	N	N	N
Clear PD、TO	Y	Y	Y

Note:

*: Different type of chip has different initial value.

* *: Reset of system depends on chip type, there are two kinds: OTP and ICE.

FS982X ICE: Program counter will execute by starting from 00H, but data will be lost due to release of power for RAM as "system reset" or "power source reset".

FS982X OTP: Selection of chip, language, memory, etc. are represented by software setting, i.e. displayed in 『Option-Setup』.

PD: Power down flag.

TO: Watch Dog Timer flag.

5.2.1 Process of Reset of Hardware System

Use the button S2 of FS982X ICE to reset hardware system, as shown in the Table 5.1 for the variation.

5.2.2 Process of Reset of Power System

Use the switch S1 of FS982X ICE to reset the power source, as shown in the Table 5.1 for the variation.

5.2.3 Process of Reset of Software System

Select 『Assemble&Run->Program Reset』 from the tool bar to execute software reset, the program counter will be reset at the 00h after execution, as shown in the Table 5.1 for the variation.

5.3 Hardware Emulation of Application

After completion of the application program, need to use the execution file generated from compiling, and download the file to FS982X ICE. If there is no error during compiling, the first executed code in “Source” will be displayed in blue highlight, at this time, may use debug command of “FASM500” to emulate the application program. Three kinds of debugging are introduced as follows:

- **Application program in Hardware**
- **Stop application program**
- **Single step execution**

5.3.1 Hardware Execution

Select 『Assemble&Run-> Run』 from the tool bar or press the hot key F9 may enter into hardware emulation. Now users may open Debug Window, including Edit, Source, Code, RAM, Register Window, too. Select 『Assemble&Run-> Stop』 from the tool bar or press the hot key F12 may stop the program during hardware emulation.

5.3.2 Hardware Termination

There are 3 kinds of method to stop the code:

- **At the breakpoint:** When the program is executed at the setup breakpoint by compiling, the program will stop.
- **When the program is executed by trace/stopover,** the program counter will stop at every step.
- **Upon the instruction of stop:** When the program is executed, select 『Assemble&Run-> Stop』 or press the hot key F12, the program counter will stop immediately.

5.3.3 Single Step Execution

“FASM500” Single Step Execution provides two ways as follows:

- **Step Over (F8)** : Step Over, trace to the code, i.e. not enter into Macro and sub-program; can trace the system procedure by the hot key F8.
- **Trace (F7)** : Trace, detailed trace to the code, i.e. enter into Macro and sub-program, can trace sub-program and Macro by the hot key F7.

5.4 Break Point

“FASM500” provides efficient breakpoint system; 3 breakpoints can be setup at the same time during hardware emulation; 10 breakpoints can be setup at the same time during software simulation.

5.4.1 How to setup Break Points?

There are two ways to setup “FASM500” breakpoint:

(1) Set-up of Mouse Click

Step 1: Use mouse to select “Source” window.

Step 2: Double click the left button of the mouse before the pre-set code of the breakpoint; successful setting is shown as the Figure 5.2.

(2) Set-up of Tool Bar

Step 1: Use mouse select “Source” window.

Step 2: Use mouse to select the code of the pre-set breakpoint.

Step 3: Select 『 Assemble&Run-> Set Breakpoint 』 from the tool bar, successful setting is shown as the Figure 5.2.

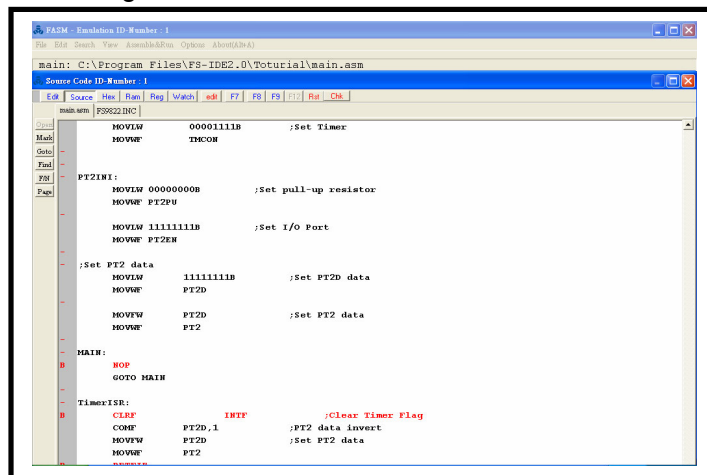


Figure 5.2 Successful Setting of Breakpoints

Note: (1) Setup breakpoint is only applied to the code can be compiled.

(2) When breakpoint setting is over max.number, system will use architecture “FIFO” to solve the problem.

5.4.2 How to Release Break Points?

The way to release breakpoint is as the same as the setting. Use “Set-up of Mouse Click” or “Set-up of Tool Bar” can release the setting by mouse clicking. Users may double click the left button of the mouse to release the set breakpoint. “B”.

6. Simulation of FS982X IDE

In addition to providing hardware emulation, FS982X also provides software simulation, to which “math library”、“code logic”、“verification of setting register” are applied. The ways to set software simulation are as follows:

Step 1. Open. Select 『Assemble&Run-> Set Debug->Simulation』 from the tool bar.

Step 2. Verification. Select 『Assemble&Run-> Assemble&Run(F10)』 from the tool bar, users may see the screen as shown in the Figure 6.1 after compiling. When the green highlight appears in “Source” means the setting successes.

10 breakpoints are provided during software simulation; only 3 breakpoints for hardware emulation, others are the same. For details, please refer to the Chapter 3, 4, 5.

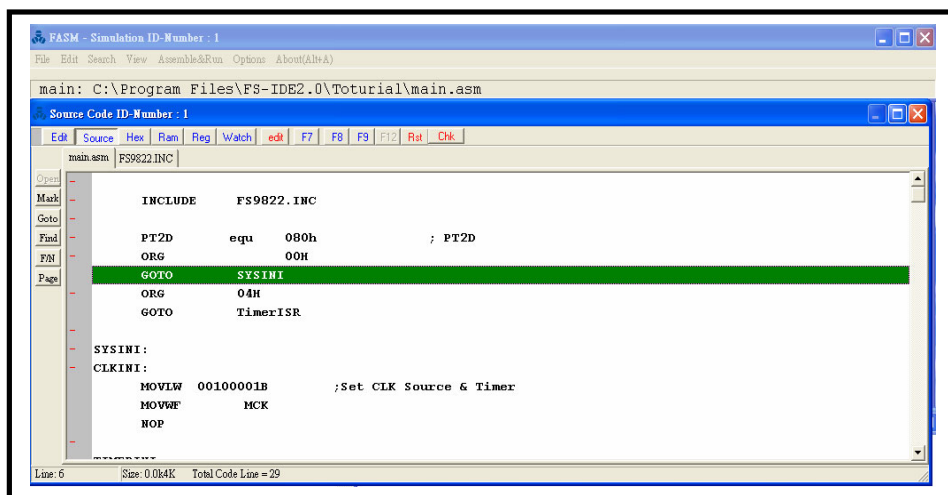


Figure 6.1 Successful entering into simulation

7. FS982X Emulation Board

7.1 General Description

FS982X Emulation Board is applied to FS9821、FS9822 and FS9823 products' emulation, as well as programming of FS982X OTP products. FS982X Emulation Board shall be operated with FS Control Board under debug and programming mode. The system provides the functions as follows:

- Applied to ICE and OTP chip of FS9821、FS9822、FS9823
- Provides LCD independent test pin
- Provides system independent test function
- Provides digital/analog I/O port
- Provides "Normal/Program" jumper to select Working or Programming Mode
- Provide 1 set LCD:4(COM) * 13(Segment).
- Provides 3 buttons
- Provides FS982X chip selection mode switch

FS982X Emulation Board is shown as the Figure 7.1.

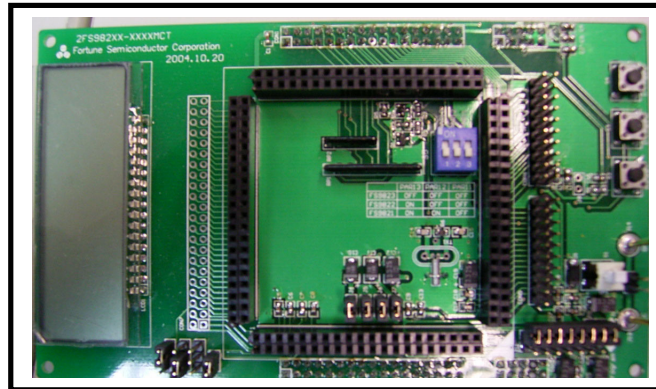


Figure 7.1 FS982X Emulation Board

7.2 Block Diagram and Pin Definition

FS982X layout is shown as the Figure 7.2 (For the circuitry, please refer to the enclosed Diagram 3). FS982X is consisted of 5 parts: components, jumper, dip switch, connector and button.

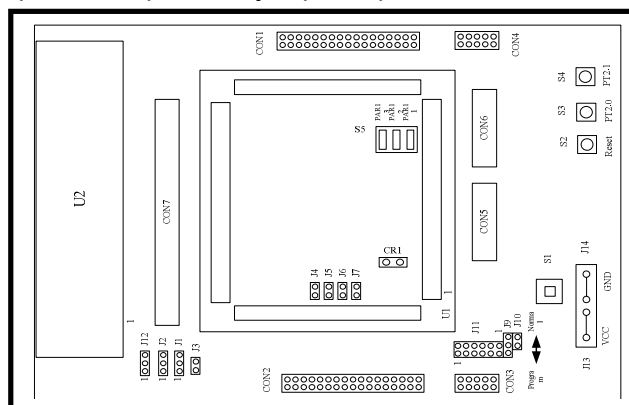


Figure 7.2 FS982X Emulation Board Layout

(1) Components

- **CR1:** 32768 Hz oscillator, provides extensional clock for the system.
- **U1:** Transfer Board location, for the connection with FS982X ICE or OTP Transfer Board.
- **U2:** LCD, the specification is 4(COM) * 13(Segment). For the true value, may refer to the enclosed Table 1.

(2) Jumpers

- **J1:** LCD V2 voltage input selection pin, Pin1-2-3 is pre-set to be open.
- **J2:** LCD V3 voltage input selection pin, Pin1-2 is pre-set to be short.
- **J3、J4、J5、J6、J7:** System power source jumpers of FS982X Emulation Board. These jumpers are pre-set to be short if there is no special purpose.
- **J8:** FS982X ICE packing internal test pin, usually it is open.
- **J9:** FS982X Emulation Board power source, as shown in the Table 7.1.

Table 7.1 J9 Jumper List

Type	Results
PIN 1-2 Short	FS Control Board provides voltage 3 V
PIN 2-3 Short	FS Control Board provides voltage 5 V
PIN 1-2-3 Open	JBAT_ICE and JVSSB_ICE input voltage 5V (Note)

Note :JBAT_ICE and JVSSB_ICE input voltage can not be over 5V.

J10: Use the jumper J10, the engineer can measure the actual current of FS982X chip.

J11: OTP programming pin, I2C is adopted during OTP programming, the pin definition is shown in the Table 7.2.

J12: Displayed selection of LCD SEGMENT 2, Pin2-3 is preset to be short.

Table 7.2 J11 Pin Definition

Pin	Function	Remark
PIN1	SDA(MDMP1_CYP)	Data PIN, Connect PIN1 with PT2[0]
PIN3	SCK(CSBMP)	Clock PIN, Connect PIN3 with PT2[1]
PIN5	RST	Reset PIN, Connect PIN5 with RST(RST_ice)
PIN7	VPP_FS98	VPP, Connect PIN7 with VPP(12V).
PIN9	VCC_FS98	VDD,Connect PIN9 with VDD(VDD_ice, 5.8V)
PIN11	GND	GND,Connect PIN11 with VSS(VSS_ice)

(3) Dip Switches

- **S5:** FS982X chip selection switch.

(4) Connectors

- **CON1:** Connected to CON1 of FS Control Board
- **CON2:** Connected to CON2 of FS Control Board
- **CON3:** Connected to CON3 of FS Control Board
- **CON4:** Connected to CON4 of FS Control Board
- **CON5:** A/D input port, I/O port of Emulation Board
- **CON6:** A/D input port, I/O port of Emulation Board
- **CON7:** LCD output pin 22*2, pin output number depends on the selected chip type.

Note: The number of the digital I/O output of CON5 and CON6 will be different according to the chip type, please refer to 《FS982X data sheet》.

(5) Buttons

- **S1:** Power switch of FS982X Emulation Board
- **S2:** Reset button
- **S3:** General button or PT2[0] interrupt button
- **S4:** General button or PT2[1] interrupt button

7.3 How to Use Emulation Board?

Notes for use of FS982X Emulation Board

- **How to Use LCD?**
- **How to Select FS982X Chip?**
- **How to Switch Operation & Programming Mode?**
- **How to Measure Current?**

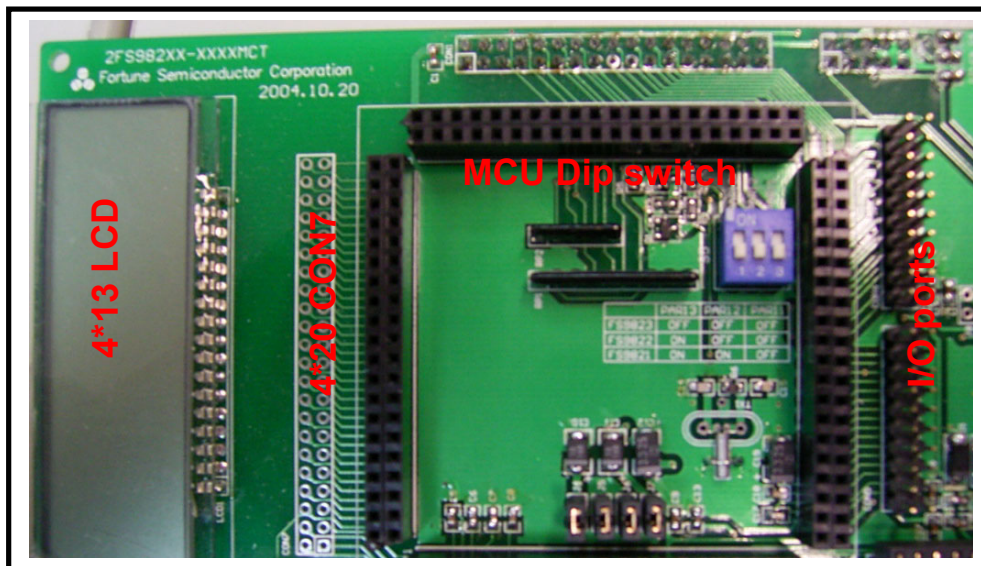


Figure 7.3 FS982X Emulation Board

7.3.1 How to use LCD?

The LCD Segment provided by each mode of FS982X is different; therefore, FS982X provides two kinds of screen for users' easier operation.

- **4*13 LCD(U2):**4(COM) * 13(Segment) LCD °
- **2*20 Connector (CON7):**4 (COM) * 40(Segment) Connector. Users may connect this connector with other specification of LCD.

System provides J12 jumper, convenient for the selection of FS982X Chip SEG2. If select Pin1-2 to be short, LCD will provide clock display (P1 · ck1 · ck2 · one); if select Pin2-3 is short, LCD will provide unit display (T1 · T2 · T3 · T4). For the LCD true value, please refer to the enclosed Table 1.

7.3.2 How to Select FS982X Chip?

FS982X Emulation Board provides dip switch (S5) for users' easier selection of chip type. The setting is as shown in the Table 7.3.

Table 7.3 Dip Switch Definition

	PAR13	PAR12	PAR11
FS9823_ICE	OFF	OFF	OFF
FS9822_ICE	ON	OFF	OFF
FS9821_ICE	ON	ON	OFF

Note: (1) Operation may be abnormal if the dip switch selected chip is different from the actually used chip.
 (2) Chip setting is only applied to FS982X ICE. Not necessary if OTP chip is used.

7.3.3 How to Use I/O Pin?

FS982X Emulation Board provides each FS982X chip's digital I/O port, analog measurement pin, consisting of connectors CON5、CON6. Users may use connectors to connect with other devices. CON5 pin definition is shown in the Table 7.4 and the Figure 7.4. CON6 pin definition is shown in the Table 7.5 and the Figure 7.5.

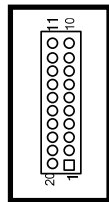


Figure 7.4 CON5

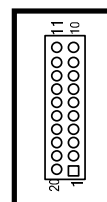


Figure 7.5 CON6

Table 7.4 CON5 Pin Definition

Pin	Definition	Pin	Definition	Pin	Definition
PIN1	VDDA	PIN8	PT20	PIN16	PT13
PIN2	OP2O	PIN9	PT22	PIN15	PT15
PIN3	REFO	PIN10	VSS_ice	PIN14	PT17
PIN4	PT10	PIN20	VS	PIN13	PT21
PIN5	PT12	PIN19	OP1O	PIN12	PT23
PIN6	PT14	PIN18	AGND	PIN11	VSS_ice
PIN7	PT16	PIN17	PT11		

Table 7.5 CON6 Pin Definition

Pin	Definition	Pin	Definition	Pin	Definition
PIN1	VDD_ice	PIN8	PT40	PIN16	PT33
PIN2	PT24	PIN9	PT42	PIN15	PT35
PIN3	PT26	PIN10	VSS_ice	PIN14	PT37
PIN4	PT30	PIN20	VDD_ice	PIN13	PT41
PIN5	PT32	PIN19	PT25	PIN12	PT43
PIN6	PT34	PIN18	PT27	PIN11	VSS_ice
PIN7	PT36	PIN17	PT31		

7.3.4 How to Switch Normal & Programming Mode?

“8 Pin Jumper ” is shown as the Figure 7.6, used for J11-J10-J9 short, can select 3 kinds of Working Mode “Normal”, “Program”, “Test after Program”. The setting steps are as follows:



Figure 7.6 8 Pin Jumper

(1) Normal mode

Method 1

- Step 1. U1 choose FS982X ICE Transfer Board ◦
- Step 2. close switch S1 ◦
- Step 3. J11's PIN 1-2 、 3-4 、 5-6 、 7-8 、 9-10 、 11-12 open ◦
- Step 4. J10 short ◦
- Step 5. J9's PIN 1-2 short ◦

Method 2

- Step 1. U1 choose FS982X ICE Transfer Board ◦
- Step 2. close switch S1 ◦
- Step 3. 8 Pin jumper jumps to “Normal” end, as shown in the Figure7.7.

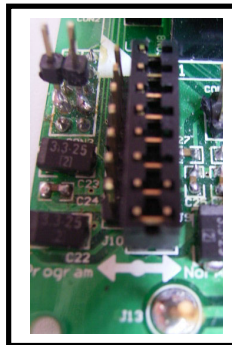


Figure 7.7 Select “Normal” Mode

(2) Program

Method1

- Step 1. U1 choose FS982X OTP Transfer Board ◦
- Step 2. close switch S1 ◦
- Step 3. J11's PIN 1-2 、 3-4 、 5-6 、 7-8 、 9-10 、 11-12 short ◦
- Step 4. J9's PIN2-3 short ◦
- Step 5. J10 open ◦

Method2

- Step 1. U1 choose FS982X OTP Transfer Board ◦
- Step 2. close switch S1 ◦
- Step 3. 8 Pin Jumper jumps to "Program", as shown in the Figure 7.8.

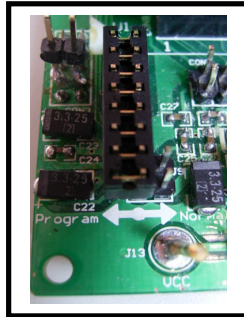


Figure 7.8 Select "Program" Mode

(3) Test after Program

Method1

- Step 1. U1 choose FS982X OTP Transfer Board ◦
- Step 2. Waiting for programming
- Step 3. Separate FS Control Board and FS982X Emulation Board.
- Step 4. Provide 2.4~3.6V power by VBAT_ice and VSSB_ice
- Step 5. Close switch S1 ◦
- Step 6. J11's Pin 1-2 、 3-4 、 5-6 、 7-8 、 9-10 、 11-12 open ◦
- Step 7. J10 short, then can test the actually function

Method2

- Step 1. U1 choose FS982X OTP Transfer Board ◦
- Step 2. Waiting for programming
- Step 3. Separate FS Control Board and FS982X Emulation Board
- Step 4. Provide 2.4~3.6V power by VBAT_ice and VSSB_ice
- Step 5. Close switch S1 ◦
- Step 6. 8 Pin Jumper jumps to "Normal" end, as shown in the Figure 7.7, then can test the function.

7.3.5 How to Measure Current?

FS982X Emulation Board provides current measurement pin J10, users may use DMM (Digital Measurement Meter) to connect the two ends of J10, and then can measure the consumption power of the chip, as shown in the Figure 7.9.

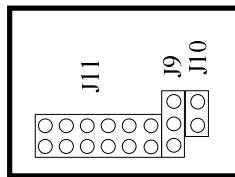


Figure 7.9 J10 block Figure

8. FS Control Board

8.1 General Description

FS Control Board, as shown in the Figure 8.1, is applied to FS9912、FS9922、FS9932、FS9821、FS9822、FS9823、FS9824、FS6811、FS3861、FS3866 and FS9855, etc. products' emulation, as well as programming all the OTP products of FSC's MCU.

This Chapter will introduce:

- System Configuration and Jumper Set: Introduce FS Control Board and each connector on the FS Control Board, notes for use of jumper.
- How to use FS Control Board: Introduce notes for emulation and simulation when FS Control Board is connected to FS982X Emulation Board.

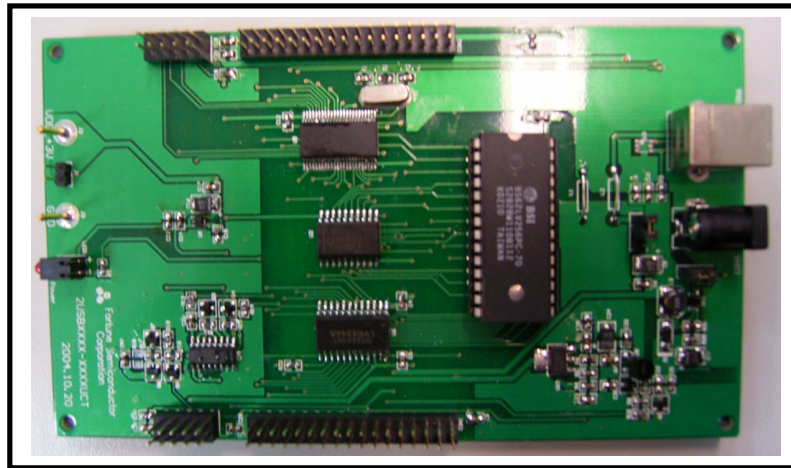


Figure 8.1 FS Control Board

8.2 Block Diagram and Pin Definition

FS Control Board layout is shown as the Figure 8.2.

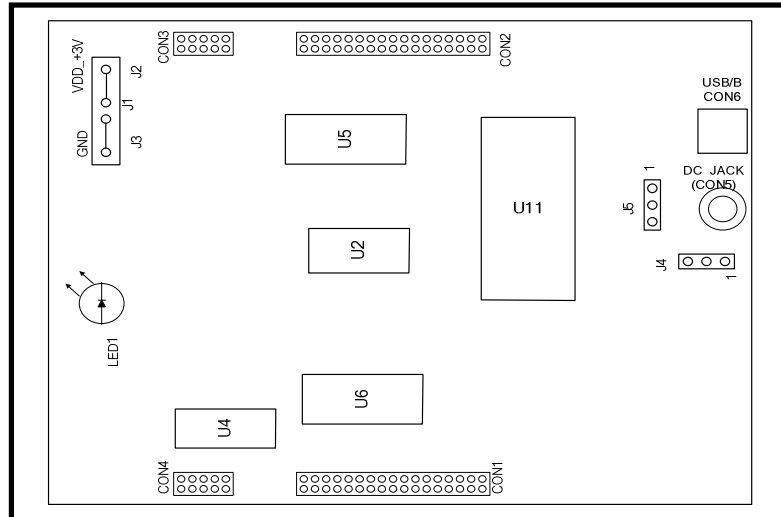


Figure 8.2 FS Control Board Layout

(1) Power System

May choose 5V power for FS Control Board via USB or DC JACK, please see the following explanation:

- **DC JACK(CON5):** Input DC 5V.
- **USB/B(CON6):** USB Connector °

(2) Setup Jumper and Memory

- **J1:** Output +3V and GND after regulation
- **J2:** Output +3V after regulation
- **J3:** GND °
- **J4:** Select input power for emulation or programming

Table 8.1 Selection of Power for Emulation or Programming

Short regulation	Description
1-2 Pin (Preset)	Power for Emulation
2-3 Pin	Power for Programming

- **J5:** Power setting

Table 8.2 Power Setting

Short regulation	Description
1-2 Pin (Preset)	Power Source from USB
2-3 Pin	Power Source from DC JACK

- **U11:** Emulated program memory, may use RAM62256 or EEPROM28C256.
- **LED1:** Power LED.

(3) Connector

- **CON1:** FS982X Emulation Board control I/O port. Can convert the out voltage via U6, makes the voltage level of FS Control Board and Emulation Board the same.
- **CON2:** Programming control I/O port
- **CON3:** System power output, provides regulated 3V output and the power for button and LED.
- **CON4:** Programming voltage output.

8.3 How to Use FS Control Board?

FS Control Board can be connected to FS982X Emulation Board or Writer Board, notes are as follows:

- **How to select power from Emulation/Writer Board?**
- **How to select power from FS Control Board?**
- **Verification of Connection of FS Control Board and PC**

8.3.1 How to Select Power Source from FS Control Board for Emulation / Programming

The voltage for FS982X emulation and programming are respectively 3V and 12V, FS Control Board provides jumper J4 for users to select power source, the setting is as follows:

- FS982X Emulation Board: Pin 1-2 of J4 is short.
- Writer Board: Pin 2-3 of J4 is short.

8.3.2 How to Select Power of FS Control Board

The power input method for FS Control Board is depending on different location, such as, when system needs debugging, USB can be connected for power supply, when FS Control Board connects to Writer Board, not connected to a computer, power can be supplied by DC JACK. FS Control Board provides Jumper J5 for users to select voltage input method, the setting is as follows:

- **USB 5V:** Pin 1-2 of J5 is short.
- **DC JACK 5V:** Pin 2-3 of J5 is short.

8.3.3 Verification of Connection between FS Control Board and PC

When CON6 which controls main panel is connected to a PC via USB, open 『Start->Setup->Control Panel->System,』, select “Hardware->device administrator” from the Tabs, and press “friendly device UI”. If “HID-compliant device” shows, means system has been connected, as shown in the Figure 8.3.

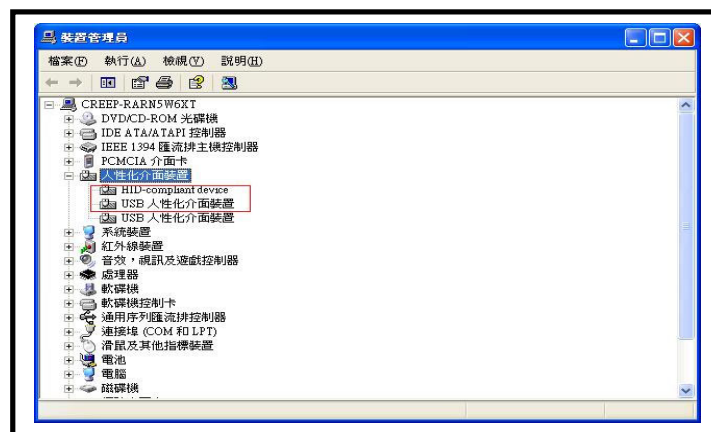


Figure 8.3 System Administrator Control Panel

Note: When Windows 98 is connected to FS Control Board at the first time, an installation disc of Windows 98 is needed.

9. OTP Programming

9.1 General Description

After the application program is developed, engineer has to use OTP chip to program the executable file into EEPROM, to check whether the application is correct or not. About executable file, please refer to the Basic Tutorial in Section 2.4.7 of Chapter 2. The programming window is shown as the Figure 9.1. This chapter will introduce details of window during programming.

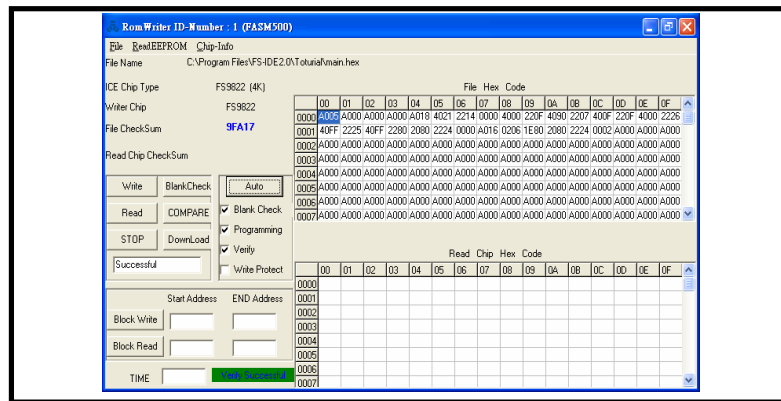


Figure 9.1 Programming Window

9.2 Introduction of Programming Window

After setting of chip, select 『 Assemble&Run->Assemble&Run 』 from the tool bar, the screen of programming is shown as the Figure 9.2, has 4 parts:

- Tool Bar
- Area of Information of Executable File
- Location of Actually Executable File
- Selection Area of Programming and Verification

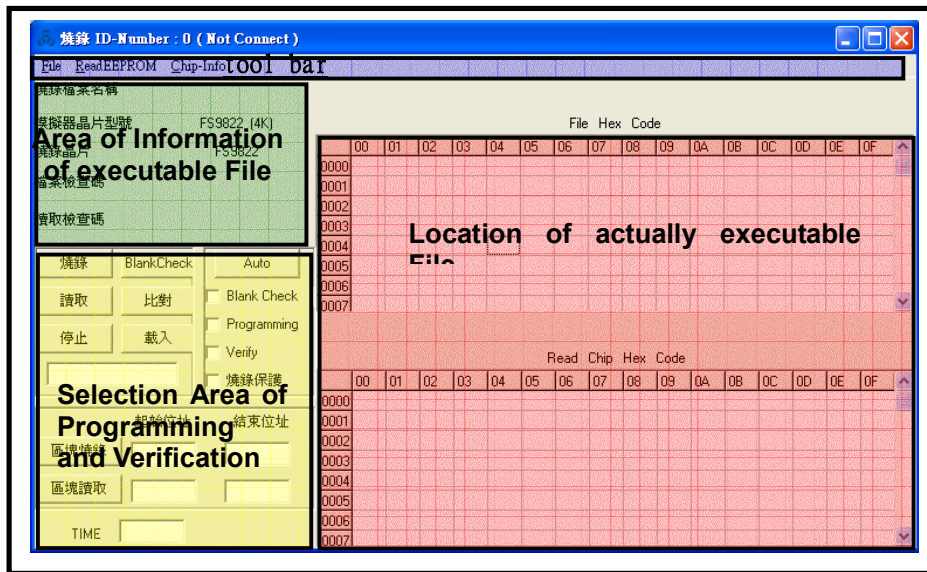


Figure 9.2 Programming Screen

9.2.1 Tool Bar

(1) FILE

This selection is to read/write the programmed file. Move the mouse to 『File』 of the tool bar and press the left button of the mouse, as shown in the Figure 9.3. The selection is as follows:

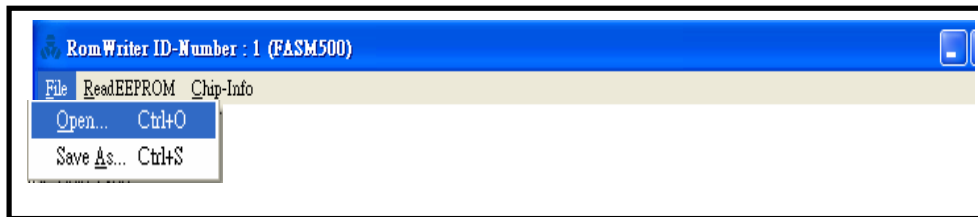


Figure 9.3 File Menu

- **Open... (Ctrl+O):** Open the executable file, then load in the contents of the file into “File Hex Code” area, the extension file name is *.HEX.
- **Save As...(Ctrl+S):** Save the executable file, the data in “Read Chip Hex Code” will be saved after selection and press, the extension file name is *.HEX.

(2) Read EEPROM

This selection is to read the contents of EEPROM 28C256, the message in the screen is shown as the Figure 9.4 as following window after selection and press.

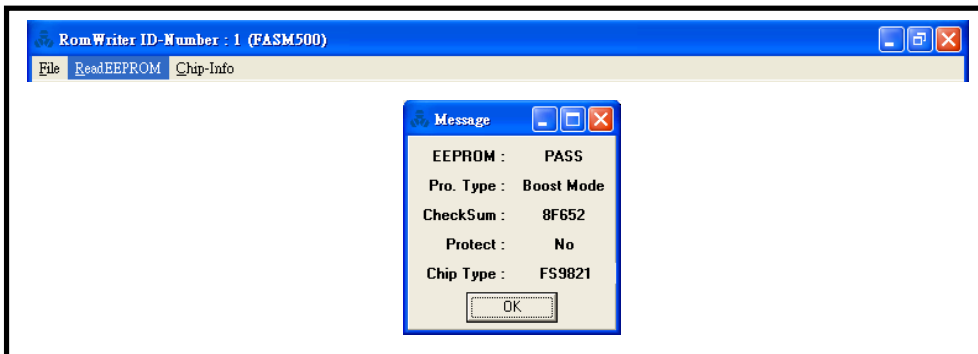


Figure 9.4 Read EEPROM data

- **EEPROM:** When “PASS” shows means system can accept single unit programming.
- **Pro. Type:** Programming Mode; Boost Mode or SPI Mode.
- **Check Sum:** Check password for executable file.
- **Protect:** Programming protection; “Yes” means chip data protected after programming; “No” means no protection to chip data after programming.
- **Chip Type:** Programmed chip type.

Note: This selection is applied only to the system memory EEPROM.

(3) Chip-Info

This selection is for confirmation of programmed chip type (only the chip programmed by Boost ROM can be detected), as shown in the Figure 9.5.

Now, the function of Chip-Info can only detect the chip type FS9823E 、FS9822E 、FS6811.

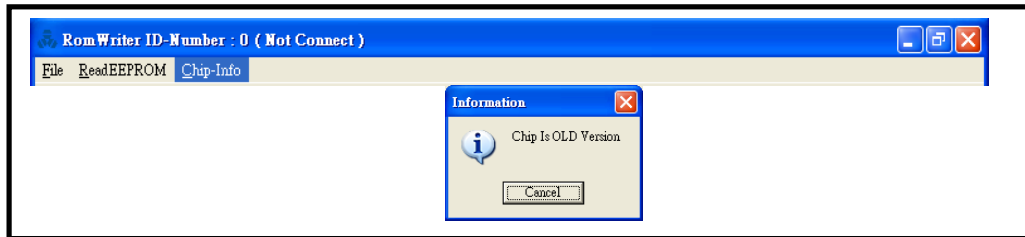


Figure 9.5 Chip Information

9.2.2 Information of Executable File

This block provides all the information of programmed file, including file name, emulation chip type, programmed chip, file check code, and read check code, as shown in the Figure 9.6.

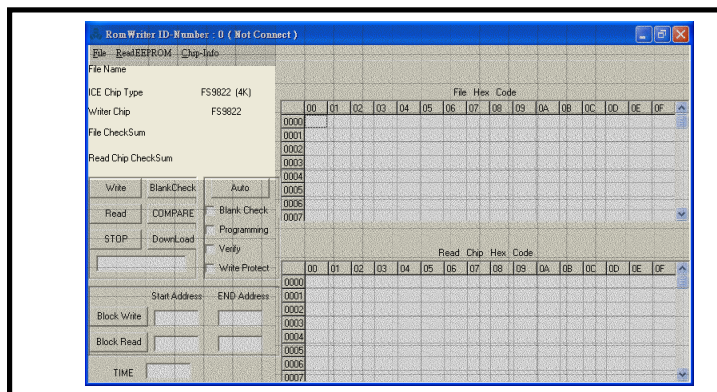


Figure 9. 6 Information of executable file

- File name: The path and file name of the executable file, immediately shows up as loading in the file.
- ICE chip type: The selected chip type during compiling.
- Write chip: The OTP chip type supposed to be programmed.
- File CheckSum: The checksum for loading in executable file, create a serial when select 『File->Open』 to load in file.
- Read CheckSum: This procedure gets checksum from OTP, can be accessed by pressing “Read” in programming or verification selection area.

9.2.3 Buffer Area of Executable File

This block provides actual data of executable file and program memory, mainly divided into two parts: “File Hex Code” and “Read Chip Hex Code”.

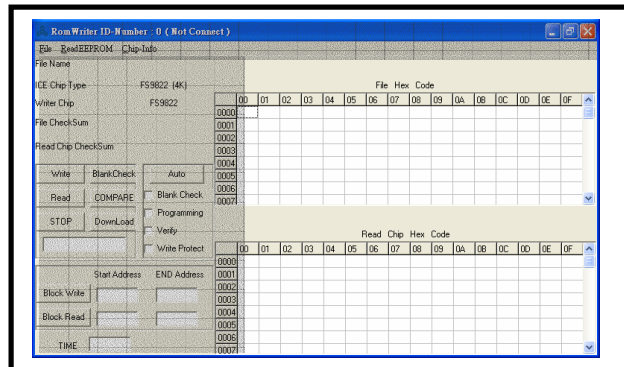


Figure 9.7 Buffer Area of Executable File

- **File Hex Code:** The area saves executable data. After the executable file is opened, the screen will show the contents of the executable file.
- **Read Chip Hex code:** The area saves actual data from OTP. This selection will completely show the contents of OTP chip code. Users may access OTP program memory by pressing “Read” in the Programming and Verification Area.

9.2.4 Selection of Programming and Verification

This block provides operation selection during programming, mainly divided into 4 parts:

- **Single Step Programming:** Including Programming, Read, Stop, Blank Check, and Compare, Load in, etc. buttons and status displaying area.
- **Continuously Programming:** Including Auto Button, Blank Check, Programming, Verify, Write Protect, etc. selections.
- **Block Programming/Read:** Block programming, Block Read/Write button, Start Address and End Address Fill in Area.
- **Programming Time Display:** Including Time Displaying, Overview of Operation, as shown in the Figure 9.8.

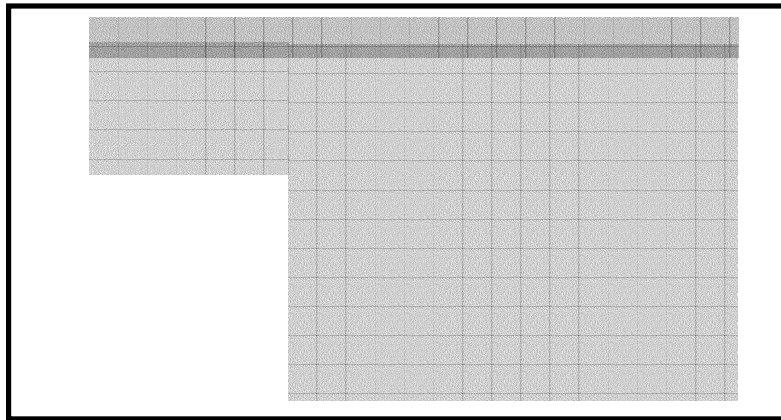


Figure 9.8 Selection of Programming and Verification

(1) Single Step Programming

- **Programming:** Program "File Hex Code" into OTP chip.
- **Read:** Read the code in OTP chip, results will be put in the block "Read Chip Hex Code"; check code will be displayed in "Programmed File Info->Read Check Code".

Note: The memory of FS Control Board (U11) or Programming Panel (U1) has to be RAM62256 when use this function.

- **Stop:** Force system to stop programming.
- **Blank Check:** Check if the OTP chip is blank.
- **Compare:** System will compare if the programming code and OTP code are the same or not.
- **Load:** Reload executable file. When any modification to "File Hex Code", "Load" should be pressed, code will be auto. updated and loaded into RAM or EEPROM for internal use.
- **Status Displaying Area:** Shows whether the loaded data is correct or not, the status displaying is as shown in the Table 9.1.

Table 9.1 Status Table

Display	Description
Successful	File loaded success
Err1	loaded to RAM62256 fails
Err2	File loaded to RAM62256 fails
Err3	File loaded to EEPROM28C256 fails
Err4	File loaded to EEPROM28C256 fails
Err5	Chip serial No. loaded fails
Err6	Loop check code compare fails

(2) Continuous Programming

- **Auto:** System will automatically program according to the selected steps after press.
- **Blank Check:** The function is as the same as "Single Step Programming->Blank Check".
- **Programming:** The function is as the same as "Single Step Programming->Programming".
- **Verify:** The function is as the same as "Single Step Programming->Compare".
- **Write protect:** Protect the programming code of chip.

(3) Block Write/Read

- **Start Address:** Input start address for internal use.
- **End Address:** Input end address for internal use.
- **Block Write:** Programming the start and end addresses for internal use.
- **Block Read:** Read the start and end address for internal use.

(4) Programming Time Display

Shows chip programming time (This area shows only in the Parallel Port screen).

10. Revision History

Ver.	Date	Page	Description
1.0	Jul. 31, '05	All	Release of First Edition (EN), corresponding to ver. 1.1 of TC

Appendix

Diagram 1: Circuitry of FS9821 、 22 、 23 ICE Transfer Board

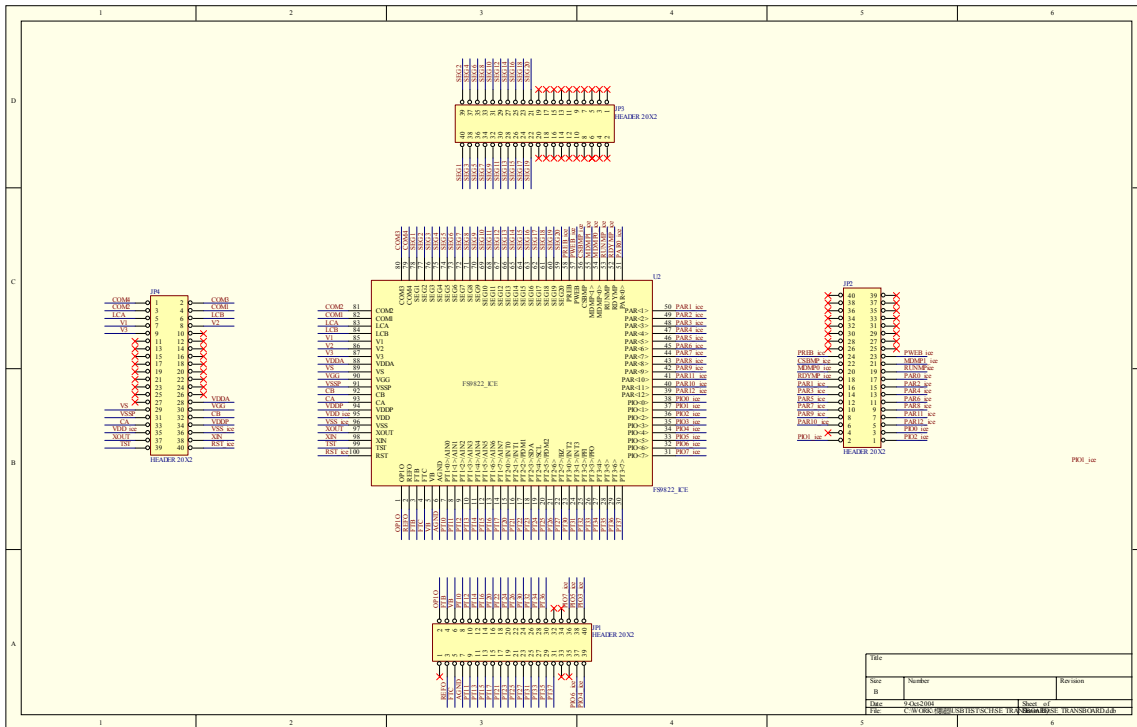


Diagram 1 FS9821&22 ICE Transfer Board Circuitry

Note: FS9823 ICE is 160 pin, which can be transferred by pin to pin, therefore no ICE circuitry is provided.

Diagram 2: Circuitry of FS9821 、 22 、 23 OTP Transfer Board

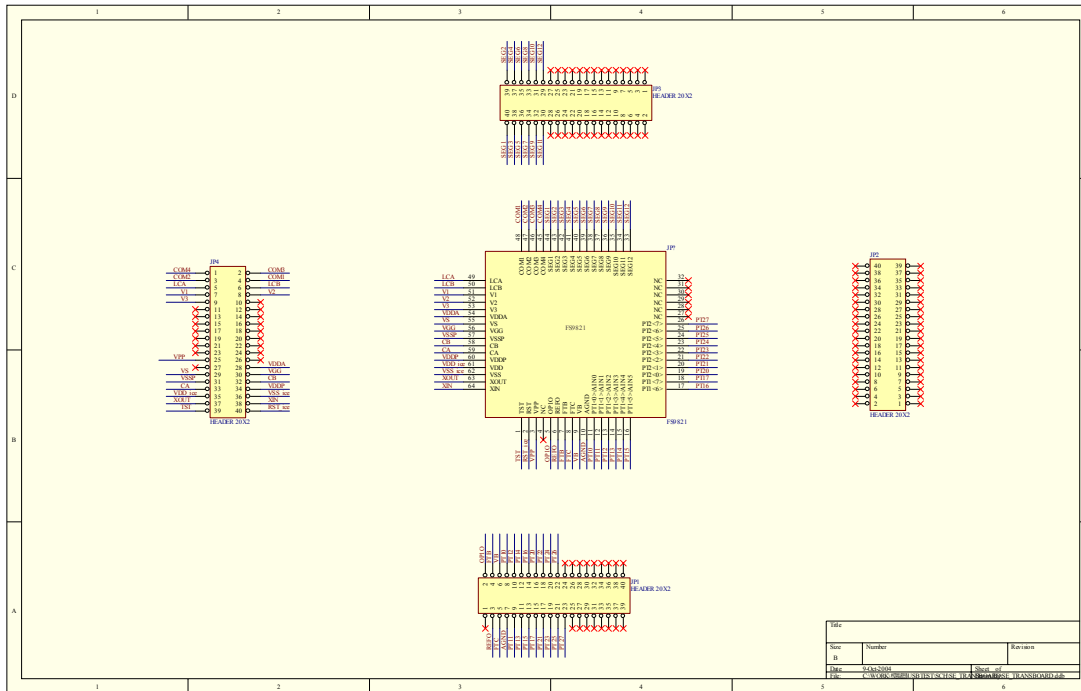


Diagram 2 (A) FS9821 OTP Transfer Board Circuitry

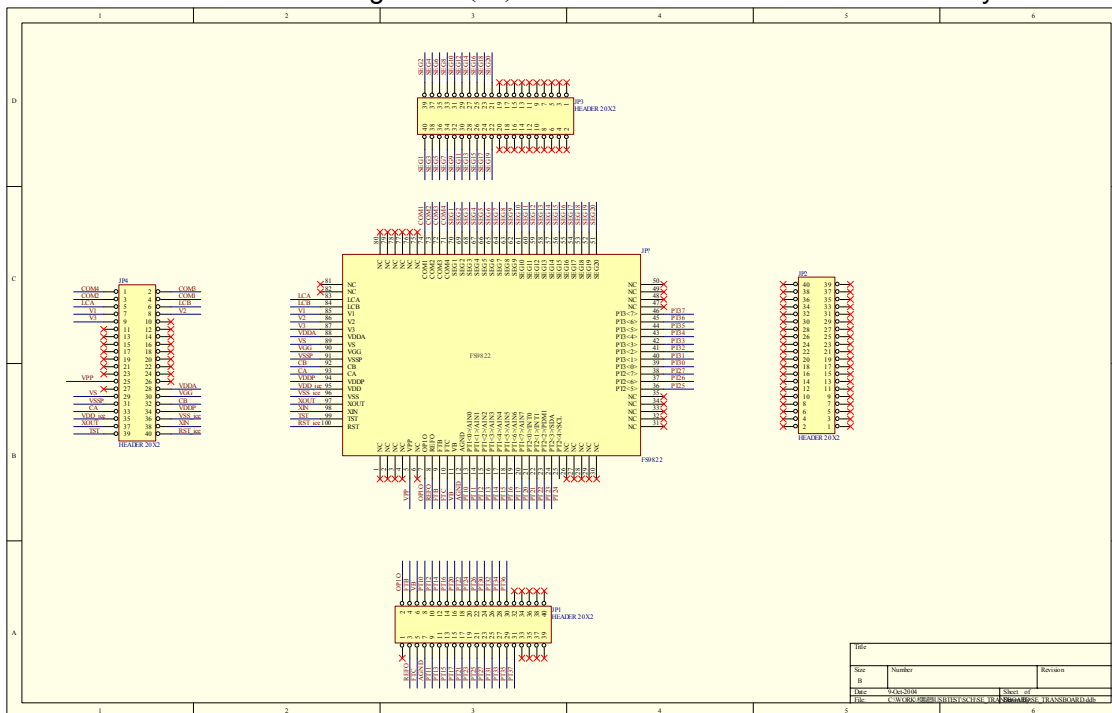


Diagram 2 (B) FS9822 OTP Transfer Board Circuitry

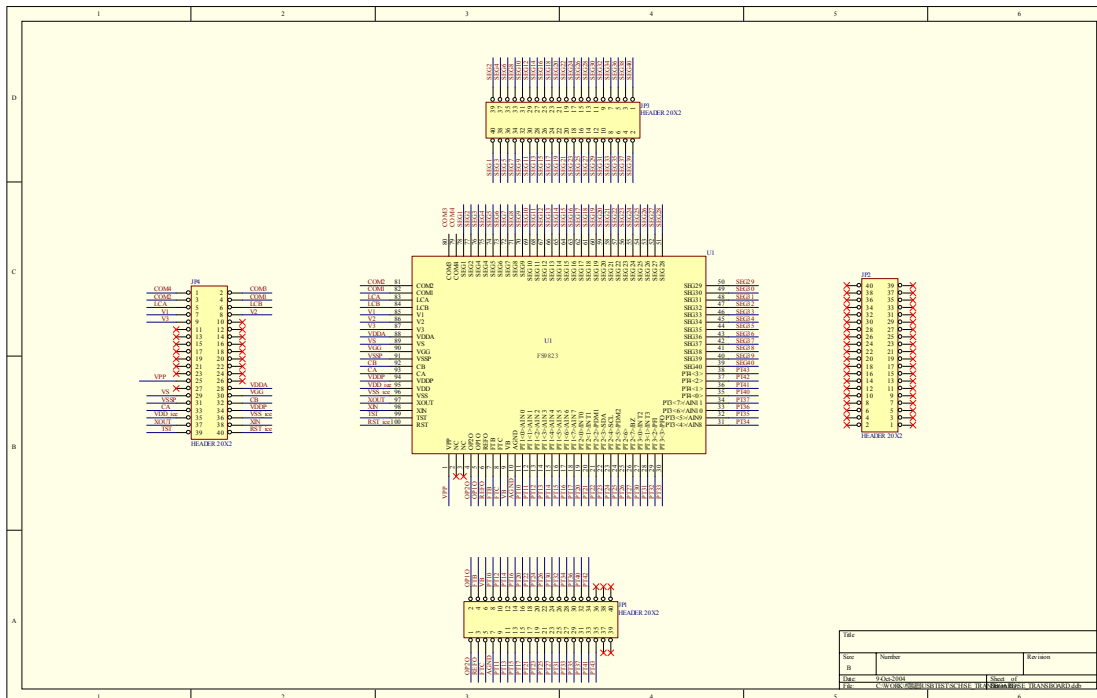


Diagram 2 (C) FS9823 OTP Transfer Board Circuitry

Diagram 3: Circuitry of FS982X Emulation Board

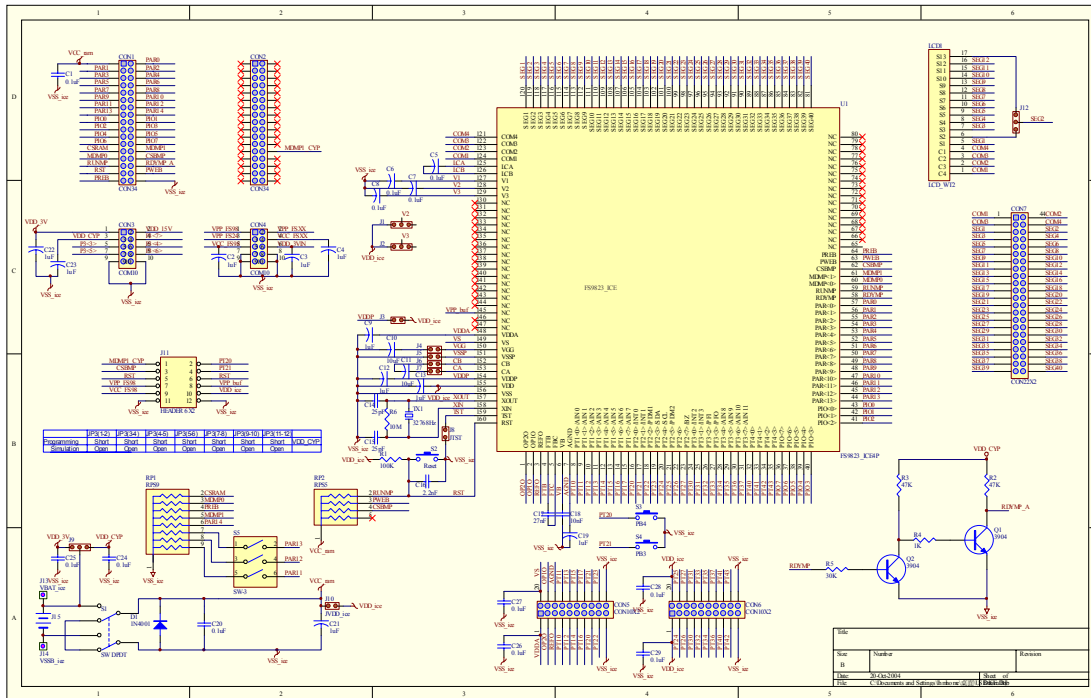
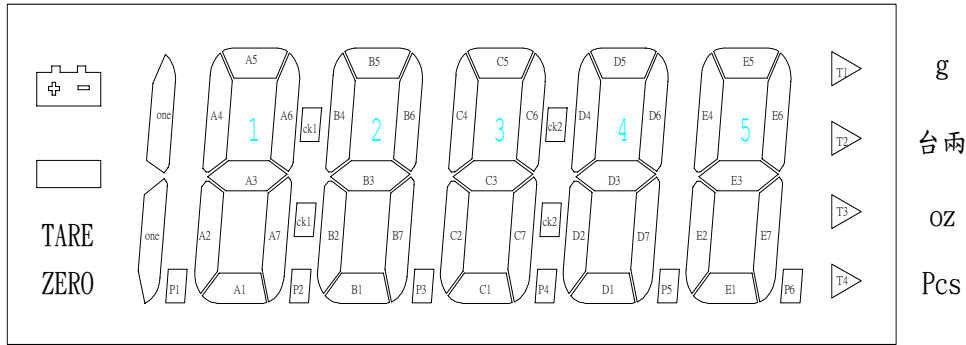


Diagram 3 FS982X Emulation Board Circuitry

Table 1:LCD T/F Table

● LCD



● LCD specification

	COM1	COM2	COM3	COM4
SEG1	ZERO	TARE		
SEG2	P1	ck1	ck2	one
SEG3	A1	A2	A3	A4
SEG4	P2	A7	A6	A5
SEG5	B1	B2	B3	B4
SEG6	P3	B7	B6	B5
SEG7	C1	C2	C3	C4
SEG8	P4	C7	C6	C5
SEG9	D1	D2	D3	D4
SEG10	P4	D7	D6	D5
SEG11	E1	E2	E3	E4
SEG12	P6	E7	E6	E5
SEG13	T4	T3	T2	T1